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ANNUAL REPORT
OF THE
BOARD OF REGENTS
OF THE
SMITHSONIAN INSTITUTION,
SHOWING
THE OPERATIONS, EXPENDITURES, AND CONDITION
OF THE INSTITUTION
FOR THE
YEAR ENDING JUNE 30, 1894.
—
REPORT
OF THE
U. S. NATIONAL MUSEUM.

OKLAHOMA LIBRARY

AN ACT PROVIDING FOR THE PUBLIC PRINTING AND BINDING, AND THE
DISTRIBUTION OF PUBLIC DOCUMENTS.

Approved January 12, 1895.

“Of the Report of the Smithsonian Institution, ten thousand copies; one thousand copies for the Senate, two thousand for the House, five thousand for distribution by the Smithsonian Institution, and two thousand for distribution by the National Museum.”

REPORT
OF THE
U. S. NATIONAL MUSEUM,
UNDER THE DIRECTION OF
THE SMITHSONIAN INSTITUTION,
FOR THE
YEAR ENDING JUNE 30, 1894.

REPORT OF THE U. S. NATIONAL MUSEUM FOR THE YEAR
ENDING JUNE 30, 1894.

SUBJECTS.

- I. Report of the Assistant Secretary of the Smithsonian Institution,
in charge of the National Museum, with Appendices.
- II. Papers describing and illustrating collections in the U. S. National
Museum.

UNITED STATES NATIONAL MUSEUM,
UNDER DIRECTION OF THE SMITHSONIAN INSTITUTION,
Washington, December 1, 1894.

SIR: I have the honor to submit herewith a report upon the present condition of the U. S. National Museum, and upon the work accomplished in its various departments during the fiscal year ending June 30, 1894.

Very respectfully,

G. BROWN GOODE,
Assistant Secretary, in charge of U. S. National Museum.

Mr. S. P. LANGLEY,
Secretary, Smithsonian Institution.

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PART I.

REPORT

UPON THE

CONDITION AND PROGRESS OF THE U. S. NATIONAL MUSEUM DURING
THE YEAR ENDING JUNE 30, 1894.

BY

G. BROWN GOODE,

ASSISTANT SECRETARY OF THE SMITHSONIAN INSTITUTION, IN CHARGE
OF THE U. S. NATIONAL MUSEUM.

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I.—GENERAL CONSIDERATIONS.

The Smithsonian Institution is the only legally authorized place of deposit for "all objects of art and of foreign and curious research, and all objects of natural history, plants, and geological and mineralogical specimens belonging to the United States," and these have served as a nucleus for the National Museum of the United States. For many years this Museum was supported entirely at the expense of the Smithson fund, and a considerable portion of the collections is the property of the Institution through gift or purchase.

Professor Huxley defines a museum as "a consultative library of objects." The National Museum is such a consultative library, and it is much more. It is an agency for the instruction of the people of the whole country, and it keeps in mind the needs of those whose lives are not occupied in the study of science as well as those of the professional investigator and teacher.

Its benefits are extended without cost or reserve to hundreds of thousands of visitors from all parts of the United States who pass through its doors each year, and also through the distribution of the duplicate specimens in the Museum, which are made up into sets, accurately named, and given to public institutions in all parts of the country.

The progress of the National Museum during the past year has been in many ways more satisfactory than in that which preceded. This is partly due to the fact that the special work which has claimed so large a share of the time of the curators since 1891, in the preparation of exhibits for the World's Columbian Exposition, has now been practically completed. Although, as a result of this work, the Museum has come into the possession of collections which otherwise it probably

would not have acquired, the distraction from the regular work of the Museum in connection with exposition matters invariably causes hindrances which it takes a long time to overcome. The exhibition halls of the Museum are always partly dismantled during the progress of these expositions, and occasionally to such an extent that these halls can scarcely be made presentable to visitors to the Museum during their continuance.

A.—HISTORY OF THE MUSEUM AND ITS DEVELOPMENT.

The history of the origin and development of the museum has been discussed in previous reports, and in a paper entitled "The Genesis of the National Museum."¹ For the present purpose it will suffice to repeat a few of the most important facts.

The formation of a national museum in the city of Washington was first undertaken by a society called "The National Institution," afterwards "The National Institute," organized in 1840, for the purpose of establishing such a museum, and which was for four years exceedingly prosperous and active. By this society the nucleus for a national museum was gathered in the Patent Office building in Washington, and public opinion was educated to consider the establishment of such an institution worthy of the attention of the Government of the United States. In 1846, having failed in securing the public recognition at which it aimed, the society became inactive, and eventually, in 1861, passed out of existence.

In January, 1847, the first Board of Regents, after many weeks of consultation and deliberation over the plans for the organization of the Smithsonian Institution, unanimously voted the following resolution:

Resolved, That it is the intention of the act of Congress, and in accordance with the design of Mr. Smithson, as expressed in his will, that one of the principal modes of executing the act and the trust is the accumulation of collections of specimens and objects of natural history and of elegant art, and the gradual formation of a library of valuable works pertaining to all departments of human knowledge, to the end that a copious storehouse of materials of science, literature, and art may be provided, which shall excite and diffuse the love of learning among men, and shall assist the original investigations and efforts of those who may devote themselves to the pursuit of any branch of knowledge.²

In the meantime the Smithsonian Institution had been organized, and from 1844 until 1858, when the so-called "National Cabinet of Curiosities" passed into the charge of the Smithsonian Institution, the term "National Museum" was not in use. From that time onward, however, it was used, unofficially, to designate the collections in the Smithsonian building.

¹ "The Genesis of the National Museum." Report of the Smithsonian Institution, Part II, National Museum, 1891, pages 273-330.

² Report of committee on organization, page 20.

After the "national cabinet" had been delivered to the Regents, annual appropriations were made by Congress for its maintenance. During the twenty-three years which followed, the collections were greatly increased, and were made the subjects of numerous important memoirs upon the natural history and ethnology of America. The public halls, with their arrangements for the exhibition of a portion of the collection, also received a due share of attention, and a certain amount of instruction and pleasure was afforded to visitors. The appropriations, however, were meager, the space limited, and the staff was so inadequate that little could be done except to keep the collections in good preservation.

The broad plan upon which the operations of the National Museum are now conducted was anticipated as early as 1853, when Professor Henry wrote:

There can be little doubt that in due time ample provision will be made for a library and museum at the capital of this Union worthy of a Government whose perpetuity depends upon the virtue and intelligence of the people.¹

The difficulties attending the formation of such a museum were appreciated by him, and in his report for 1849 he spoke with much emphasis of the difficulties attending the assumption by the Institution of the care of the national collections, and in the report of the Institution for 1870² he again carefully expressed his opinion as to the aims proper to such a museum.

"There is [he wrote] scarcely any subject connected with science and education to which more attention is given at the present day than that of collections of objects of nature, and art, known under the general denomination of museums. This arises from their growing importance as aids to scientific investigation and instruction."

In the report for 1873³ allusion was made to the increase in the national collections, even then very great, "requiring the utmost exertions of the limited force connected with the National Museum for its proper treatment."

Although the appropriations for the Museum have of late years been more liberal, it is certain that, on account of the immense annual increase in the quantity of material received, quite as much caution as ever is still needed in the development of its plans for the future.

The Smithsonian Institution from its foundation fostered explorations, and its Museum was enriched by the numerous ethnological and natural history objects brought home by the explorers. Many gifts were received from private sources, and valuable objects were deposited in its Museum for safe-keeping. The nucleus of its collections was a small but valuable cabinet of minerals formed by the founder, James Smithson, who was himself a chemist and mineralogist of high repute, and a Fellow of the Royal Society of London.

¹ Report of the Smithsonian Institution, 1853, page 245.

² Report of the Smithsonian Institution, 1870, page 31.

³ Report of the Smithsonian Institution, 1873, page 48.

At the time of the establishment of the Institution several naval expeditions and surveys of the public domain were being organized by the Government, and during their progress large collections of ethnological and natural history objects were made. Important foreign material was obtained by the Pacific Exploring Expedition, Perry's Expedition to Japan, and other naval expeditions, while the naturalists attached to the Pacific Railroad survey, the Mexican Boundary Survey, and the surveys under the Army Engineer Corps, brought together great collections illustrating the natural resources and ethnology of North America.

A new source of growth, subsequent to 1871, was the exploration of the waters of North America by the United States Fish Commission, whose connection with the Institution has always been intimate and mutually helpful, the scientific resources of the latter having contributed in a very large degree to the practical efficiency of this the greatest agency for public fish culture in the world.

At the close of the Centennial Exhibition of 1876 the exhibits of the United States Government, and those of numerous foreign governments and of private exhibitors, came to the National Museum.

A new period now began. The storage rooms and exhibition halls of the Smithsonian building were already overflowing with the accumulations of thirty years, and the small number of persons employed in caring for them were overburdened and unable properly to perform the task. The scope of the collections had become wider, and a new and broader classification was found to be necessary. The growth of the country in wealth and culture had led to the establishment of many local museums, and the educational influences flowing from these and from the Centennial Exhibition caused a demand for more efficient methods of museum administration.

The exhibition of 1876 had been indeed an event of great educational importance to the people of the United States; and not the least of its good results was the lesson it taught as to the possibilities for good in public museums.

The objects which were given to the United States for its National Museum at the close of the Centennial were of large intrinsic value, and were also very important from the fact that the necessity of caring for them led to the erection of a large building for the expansion of the Museum itself; this was finished in 1881, at which time the Museum was entirely reorganized.

In the early years Professor Baird, then the Assistant Secretary, with two or three assistants, had been able to give all necessary attention to the care of the collections, and the Museum had never been formally divided into departments.

When the reorganization was made in 1881, under the immediate care of the present Assistant Secretary, the diversity of the collections made it necessary to establish a number of departments, each of which was placed in charge of a curator. The staff has since been constant

increasing, and is at present composed of the officer in charge and thirty-two curators and custodians, twenty-two of whom receive no salary from the Museum: there are also eight administrative offices, each under its own chief, while in connection with the general work of administration there is in the Museum a library, a chemical laboratory, a photographic laboratory, and various workshops for taxidermy, modeling, and for the preparation of skeletons for study or exhibition.

THE DEVELOPMENT OF THE MUSEUM IDEA.

The history of the National Museum may be divided into three rather well-marked periods:

First, that from the foundation of the Smithsonian Institution to 1857, during which time specimens were collected purely and solely to serve as materials for research, no special effort having been made to exhibit them to the public or to utilize them, except as a foundation for scientific description and theory.

Second, the period from 1857, when the institution assumed the custody of the "National Cabinet of Curiosities," to 1876. During this time the Museum became a place of deposit for scientific material which had already been studied, this material, so far as convenient, being exhibited to the public and, so far as practicable, made to serve an educational purpose.

Third, the present period, beginning in the year 1876, during which the Museum had entered more fully into the additional task of gathering collections and exhibiting them with reference to their value from an educational standpoint.

During the first period the main object of the Museum was scientific research; in the second the establishment became a museum of record as well as of research; while in the third period has been added the idea of public education.

The three ideas, record, research, and education, cooperative and mutually helpful as they are, are essential to the development of every great museum. The National Museum endeavors to promote them all.

It is a *museum of record*, in which are preserved the material foundations of an enormous amount of scientific knowledge—the types of numerous past investigations. This is especially the case with those materials that have served as a foundation for the reports upon the resources of the United States.

It is a *museum of research*, which aims to make its contents serve in the highest degree as a stimulus to inquiry and a foundation for scientific investigation. Research is necessary in order to identify and group the objects in the most philosophical and instructive relations, and its officers are therefore selected for their ability as investigators, as well as for their trustworthiness as custodians.

It is an *educational museum*, through its policy of illustrating, by specimens, every kind of natural object and every manifestation of

human thought and activity, of displaying descriptive labels adapted to the popular mind, and of distributing its publications and its named series of duplicates.

In conclusion I will review what seems to have been definitely accomplished since the time of reorganization in 1881.

The definite steps of progress may be summarized as follows:

(1) An organization of the Museum staff has been effected, efficient for present purposes and capable of expansion and extension as occasion may require, and many capable museum experts have been trained for work in other institutions.

(2) Through the agency of this staff the materials in the Museum, the accumulations of nearly half a century, have been examined, classified, and brought under control and arranged in such manner as to insure their safety and make them available for study.

(3) The collections have been increased to nearly seventeen fold their former extent.

(4) A considerable beginning has been made toward the development of a well labeled and effectually installed exhibition-series, available for the instruction of the public.

(5) A thorough study of the organization and systems of classification in other museums throughout the world has been made, the results of which are beginning to appear in the work of the Museum staff and which will be made available for other institutions through a report now in preparation upon the principles and methods of museum administration.

(6) Many new methods of installation have been developed by experiment in the Museum, and the best and most available of those employed elsewhere have been adopted. Our new methods have been adopted in many similar establishments at home and abroad.

(7) The art of taxidermy and the making of museum models has been advanced and dignified by the policy adopted in the treatment of the experts in the employ of the Museum.

(8) Science has been forwarded by the publication of some thousands of papers describing the materials in the Museum, while the work of specialists in the production of these papers has greatly enhanced the value of the national collections.

(9) Popular educational work of unquestioned value has been accomplished by participation in great expositions in Philadelphia, Berlin, London, New Orleans, Cincinnati, Louisville, Madrid, and Chicago.

(10) Hundreds of thousands of named specimens have been distributed to other museums and to colleges and schools.

THE POSSIBILITIES FOR THE FUTURE.

That the United States must have a National Museum worthy of the dignity of the nation is self-evident.

Every country has a museum or group of museums in its capital city—centers of scientific and educational activity—the treasure-house of the people, filled with memorials of national triumphs in the fields of science, art, and industrial progress.¹

These are legitimate objects of national pride, for upon the character of its museum and libraries intelligent persons visiting a country very properly base their judgment as to the nature and degree of the civilization of the people.

Washington may without question be made the seat of one of the greatest museums in the world. It may perhaps be neither practicable nor desirable to gather together in this city extensive collections of ancient mediæval art, but a representative series of such objects will undoubtedly grow up which will tend to educate the public taste, and promote the study of the elements of art and the history of civilization, and forward the arts of design. This having been accomplished, attention should be directed mainly toward the exhibition of the geology and natural history of America and its natural resources, to the preservation of memorials of its aboriginal inhabitants, and the encouragement of the arts and industries of our own people.

It is evident that the National Museum of the United States will of necessity have features peculiar to itself developed in response to the peculiar needs of the people of this continent. It should be remembered that the national collections of every principal European nation are divided into several groups, each under separate administration, though often within the general control of some central authority. In France, for instance, most of the museums are under the Ministry of Public Instruction, and in England, to a less extent, under the Department of Science and Art.

In the great capitals of Europe the public collections are scattered through various parts of the same city, in museums with distinctive names and independent in their organizations. Much of the work which should properly be done by such museums is omitted, because no one of them has seen fit to undertake it; while, on the other hand, much labor is duplicated, which is perhaps equally unfortunate—collections of similar scope and purpose being maintained in different parts of the same city. One of the chief objections to such division of effort is that much of the value of large collections in any department is lost by failure to concentrate them where they may be studied and compared side by side. In Washington the national collections are all, without exception, concentrated in one group of buildings. The Army Medical Museum now occupies a building side by side with those under the control of the Smithsonian Institution, and this proximity, in connection with the long-established policy of cooperation

¹Most of the older nations have museums devoted to their military achievements and triumphs, but our country has no need or desire to enter into this field of work.

between the two organizations, renders them, for all practical purposes, united in interest.

Although the appropriations from the public treasury for the maintenance of the National Museum are small, compared with those in several European countries, the value of objects given by private individuals is proportionately large. The actual value of such contributions for ten years past, has not, it is estimated, fallen short of \$20,000 a year, and in some years it has been greater.

Among important gifts may be mentioned the George Catlin Indian gallery, of inestimable value to the American historian and ethnologist, the gift of Mr. Joseph Harrison; the collection of North American insects, given by Prof. C. V. Riley; the collection bequeathed in 1887 by the late Isaac Lea, of Philadelphia, containing, besides minerals and other objects, about 20,000 conchological specimens, and appraised by the State at \$10,000; the Bendire and Ralph collections of American birds' eggs, given to the Smithsonian Institution; the Lacey collection of fossil plants, and the collection of the American Institute of Mining Engineers, for the transfer of which from Philadelphia to Washington a special appropriation was made by Congress.

Some exceedingly valuable collections in this country and in Europe have been bequeathed to the Smithsonian Institution which have not yet come into its possession. It is estimated that within the past fifteen years individuals to the number of at least 2,000 have made gifts to the Museum to the value of \$100 or more.

The National Museum now contains over three millions of objects.

The intrinsic value of such collections as these can not well be expressed in figures. There are single specimens worth hundreds, others worth thousands of dollars, and still others which are unique and priceless. Many series of specimens, which owe their value to their completeness and to the labor which has been expended on them, can not be replaced at any price. The collections at a forced sale would realize more than has been expended on them, and a fair appraisal of their value would amount to several millions of dollars.

One of the most striking features in the affairs of the Museum is the manner in which its collections are increasing. In 1894 the number of specimens is almost seventeen times as great as twelve years ago.

In the last fiscal year 1,161 new lots, or groups, of specimens, including about 171,000 objects, were received for entry upon the Museum catalogues.

In the direct purchase of specimens but little money has been spent, less perhaps in fifty years than either France, England, Germany, or Austria expends in a single year on similar objects. The entire Museum is the outgrowth of Government expeditions and exhibitions, and of the gifts prompted by the generosity of the American people.

As might be supposed, a considerable proportion of the objects given are duplicates of material already on hand, and although these contri-

butions can, with the utmost advantage, be used for distribution to museums and schools, they do not materially increase the value of the collections for study by specialists and for general educational purposes. The need of a larger fund for the purchase of specimens is yearly more manifest. Exceedingly important material is constantly offered at prices very much below what it would cost to obtain it by collecting, and in many instances, when refused, it is eagerly taken by the museums and institutions of Europe.

The Museum in its present condition may be compared to a book from which pages here and there have been omitted, so that the narrative is disjointed and incomplete.

The museums of England are rich with the accumulations of centuries. The National Museum of the United States is young, and has enormous deficiencies in every department. It needs, more than any museum in Europe, the opportunity to increase its resources through purchase. The total amount expended for the purchase of specimens for the National Museum since its foundation has not exceeded \$20,000, and never in one year more than \$8,500.

For the purchase of specimens for the South Kensington Museum, from 1853 to 1887, \$1,586,634 was expended, or a yearly average of nearly \$47,000.

Toward her other museums England is equally liberal. Exact statistics are not at hand, but it is quite within bounds to assert that her average expenditures for the purchase of new objects for museums in London is not less than \$500,000 a year.

Our Museum is the result of the activities of an enlightened Government. Through a thousand channels materials for the formation of a museum come into the possession of the Government, and out of such materials our Museum has been built. A museum formed in this manner, however, suffers sooner or later from immense accumulations of objects of certain kinds and from the absence of others. This is true of the National Museum. At the outset no additions were unwelcome, and the expectation that all important deficiencies would be supplied might properly be indulged in. As the years have passed, however, it has become more and more apparent that many of these deficiencies can only be supplied by purchase.

More striking present results might certainly have been attained by limiting the developments of the Museum to special fields. We have, however, had in view the future as well as the present, and no object has been refused a place in the Museum which is likely to be needed, even in the remote future, in the development of whatever grand museum plans the nation may ultimately be willing to promote.

B.—ORGANIZATION AND SCOPE OF THE MUSEUM.

The National Museum is under the charge of the Smithsonian Institution, and its operations are supervised by the Board of Regents of the Institution.

The Secretary of the Smithsonian Institution is by law the "keeper of the Smithsonian Museum," and the Assistant Secretary, by the usage of nearly fifty years, its executive head.

In the act of Congress passed in 1846, to establish the Smithsonian Institution, are contained the following provisions concerning the scope of the museum to be placed under its charge:

1. The act above referred to provides that "all objects of art and of foreign and curious research, and all objects of natural history, plants, and geological and mineralogical specimens belonging, or hereafter to belong, to the United States, which may be in the city of Washington," shall be delivered to the Regents of the Smithsonian Institution, and together with new specimens obtained by exchange, donation, or otherwise, shall be so arranged and classified as best to facilitate examination and study.

2. It provides that, in proportion as suitable arrangements can be made for their reception, these objects shall be delivered to such persons as may be authorized by the Board of Regents to receive them.

3. It provides that they shall be arranged in such order and so classified as best to facilitate their examination and study.

4. It provides that they shall thus be arranged in the building to be erected for the Institution.

5. It authorizes the Regents to obtain new specimens, by exchange of duplicate specimens and by gift, and directs also that they shall be appropriately classified and arranged.

The National Museum thus became the authorized place of deposit for all objects of art, archæology, ethnology, natural history, mineralogy, geology, etc., belonging to the United States or collected by any agency whatsoever for the Government of the United States, when no longer needed for investigations in progress.

The collections in the Museum are intended to exhibit the natural and industrial resources, primarily of the United States and secondary of other parts of the world, for purposes of comparison.

The activities of the Museum are exerted especially in three directions:

1. The permanent preservation of the collections already in its possession, which depends chiefly upon the vigilance of the curators and the skill of the preparators.

2. The increase of the collections which are acquired—

- (1) From the various Government surveys and expeditions, in accordance with law;

- (2) By gift from individuals, from other institutions, and from foreign governments;

- (3) By exchange for its duplicate specimens or for publications;

(4) By the efforts of officers of the Museum, who make collections in connection with their regular duties, or are detailed for special service of this nature;

(5) By purchase when appropriations are made by Congress for that purpose.

3. The utilization of the collections, which is effected by exhibiting them to the public, and by encouraging investigations on the part of the officers of the Museum and other suitable persons, and facilitating the publication of the results; also by the distribution to other museums and educational institutions of duplicate specimens, which have formed the basis of scientific investigation, these being identified and labeled by the best authorities.

The collections of the National Museum are made up to a very large extent of the following materials:

1. The natural history and anthropological collections accumulated since 1850 by the efforts of the officers and correspondents of the Smithsonian Institution.

2. Collections which have resulted from explorations carried on more or less directly under the auspices of the Smithsonian Institution, or resulting from explorations carried on by the Smithsonian Institution in connection with educational institutions or commercial establishments.

3. Collections which have been obtained through the courtesy of the Department of State and the cooperation of United States ministers and consuls.

4. The collection of the Wilkes exploring expedition, the Perry expedition to Japan, and other naval expeditions.

5. Collections made by the scientific officers of Government surveys, such as the Pacific Railroad Survey, the Mexican Boundary Survey, and the surveys carried on by the Engineer Corps of the United States Army and by officers of the Signal Corps of the United States Army stationed in remote regions.

6. Collections obtained by the United States Geological Survey, the United States Fish Commission, and those resulting from the activities of the United States Department of Agriculture and other departments of the Government.

7. The remnant of the collections of the old "National Institute."

8. The collections made by the United States to illustrate the animal and mineral resources, the fisheries, and the ethnology of the native races of the country on the occasion of the Centennial Exhibition at Philadelphia in 1876; the fishery collections displayed by the United States at the International Fisheries Exhibition at Berlin in 1880 and at London in 1883, and the collections obtained from various local expositions, as, for instance, the New Orleans Cotton Centennial Exposition in 1884 and 1885, and the Cincinnati Exposition in 1887.

9. The collections given by the governments of the several foreign nations, thirty in number, which participated in the exhibition at Philadelphia in 1876.

10. The industrial collections given by numerous manufacturing and commercial houses of Europe and America at the time of the Philadelphia exhibition and subsequently.

11. The materials received from museums in Europe and America in exchange for duplicate specimens.

12. Collections received as gifts, deposits, or in exchange, from individuals, numbering usually from 1,000 to 1,500 each year.

The publications of the Museum consist of—

1. The Annual Report.
2. The Proceedings of the United States National Museum.
3. The Bulletin of the United States National Museum.
4. The series of circulars.

The papers by members of the Museum staff, relating to the collections, have been printed in scientific periodicals of the United States and also in Europe.

RELATIONS OF THE MUSEUM TO THE SMITHSONIAN INSTITUTION.

The Smithsonian Institution, although it bears the name of a foreigner, has for half a century been one of the most important agencies in the intellectual life of our people. It has been a rallying point for the workers in every department of scientific and educational work, and the chief agency for the free exchange of books, apparatus of research, and of scientific intelligence between this and other countries. Its publications, which include more than two hundred volumes, are to be found in all the important libraries in the world, and some of them, it is safe to say, on the work-table of every scientific investigator. Its great library constitutes an integral and very important part of the national collection at the Capitol, and its museum is the richest in existence in many branches of the natural history and ethnology of the New World. Many wise and enlightened scholars have given their best years to its service, and some of the most eminent men of science to whom our country has given birth, have passed their entire lifetime in working for its success.

Through these books, through the reputation of the men who have worked for it and through it, and through the good accomplished by its system of international exchange, by means of which within the past forty-two years 1,380,075 packages of books and other scientific and literary materials have been distributed to every region of the earth, it has acquired a reputation at least as far-reaching as that of any other institution of learning in the world.

It is therefore representative of what is deemed in other lands the chief glory of this nation, for whatever may be thought in other countries of American art and literature, or of American institutions generally, the science of America is everywhere accepted as sound, vigorous, and progressive.

In the scientific journals of Great Britain and other European countries the reader finds most appreciative reviews of the scientific publications of the Smithsonian, the Museum, the Bureau of Ethnology, the Geological Survey, the Department of Agriculture, and the Fish Commission, and they are constantly holding up the Government of the

United States as an example of what governments should do for the support of their scientific institutions.

It is surely a legitimate source of pride to Americans that their work in science should be so thoroughly appreciated by other nations, and it is important that this reputation should be maintained. Nothing can be more in consonance with the spirit of our Government, or more in accord with the injunction of Washington in his Farewell Address, admiringly quoted by Sir Lyon Playfair in his address as president of the British Association for the Advancement of Science:

Promote, then, as an object of primary importance, institutions for the general diffusion of knowledge.

In proportion as the structure of a government gives force to public opinion, it should be enlightened.

No one has yet explained, except by conjecture, why James Smithson selected the United States as the seat of his foundation. He had no acquaintances in America, nor does he appear to have had any books relating to America except two. Rhees quotes from one of these (Travels through North America, by Isaac Weld, secretary of the Royal Society) a paragraph concerning Washington, then a small town of 5,000 inhabitants, in which it is predicted that "the Federal city, as soon as navigation is perfected, will increase most rapidly," and that at a future day, if the affairs of the United States go on as prosperously as they have done, it will become the grand emporium of the West and rival in magnitude and splendor the cities of the Old World.

Inspired by a belief in the future greatness of the new nation, realizing that while the needs of England were well met by existing organizations, such as would not be likely to spring up for many years in a new, poor, and growing country, he founded in the new England an institution of learning, the civilizing power of which has been of incalculable value. Who can attempt to say what the condition of the United States would have been to-day without this bequest?

Well did President John Quincy Adams say:

Of all the foundations of establishments for pious or charitable uses which ever signalized the spirit of the age or the comprehensive beneficence of the founder, none can be named more deserving the approbation of mankind.

The most important service by far which the Smithsonian Institution has rendered to the nation has been that extended from year to year since 1846—intangible but none the less appreciable—by its constant cooperation with the Government, public institutions, and individuals in every enterprise, scientific or educational, which needed advice, support, or aid from its manifold resources.

There have been, however, material results of its activities, the extent of which can not fail to impress anyone who will look at them. The most important of these are the Library and the Museum, which have grown up under its fostering care.

The relations of the museum and the library of the institution to the institution and to each other are so intimate as to merit special mention here. The library has been accumulated without aid from the Treasury, and is in fact, the result of an extensive system of exchanges, the publications of the Institution having been used to obtain similar publications from institutions of learning in all parts of the world. The value of the books distributed since the institution was opened, must have been nearly \$1,000,000, or nearly twice the original bequest of Smithson.¹ Many of the publications in each of these series are now out of print.

In return for these, and by purchase, it has received the great collection of books which forms its library and which is one of the richest in the world in the publications of learned societies, and therefore of inestimable value, containing, as it does, the record of actual progress in all that pertains to the mental and physical development of the human family, and affording the means of tracing the history of every branch of positive science since the days of the revival of letters until the present time. This library was, in 1865, deposited at the Capitol, as a portion of the Congressional Library.

The Smithsonian Collection, which includes more than three hundred thousand volumes and parts of volumes, constituting perhaps one-fourth of the National Library, is to be installed in a special hall of its own upon the main floor of the new Library Building. The rapidity with which it is increasing is indicated by the fact that in 1894 37,952 titles were added.²

The institution has probably done more toward building up a great library in Washington than would have been possible, had all its income been devoted strictly to library work, as was at one time seriously proposed.

The books are still deposited chiefly in the Capitol, but though they have now increased from 40,000 to fully 250,000 volumes and parts of volumes, and form one of the most valuable collections of the kind in existence, they not only remain unbound, but in a far more crowded and inaccessible condition than they were before the transfer, a condition of affairs which will doubtless soon be remedied.

The purchasing power of the publications of the Institution, when offered in exchange, is far greater than that of money, and its benefit is exerted chiefly in behalf of the National Library, and also to a considerable extent in behalf of the National Museum.

¹ This estimate is based upon the prices which are charged for the books by second-hand dealers, as shown in their sale catalogues.

² The working libraries of the National Museum and the Bureau of Ethnology are distinct from the general Smithsonian library and are separately administered. All of these are placed at the service of advanced students and specialists.

The amount expended during the past forty years from the private fund of the Institution in the publication of books for gratuitous distribution has been fully half as much as the original Smithsonian bequest.

These publications have had their influence for good in many ways; but, in addition to this, a library much more than equal in value to the outlay has, through their buying power, come into the possession of the nation.

In addition to all this, a large amount of material has been acquired for the Museum by direct expenditure from the private fund of the Smithsonian Institution. The value of the collections thus acquired is estimated to be more than equal to the whole amount of the Smithsonian bequest.

The early history of the Museum was much like that of the library. It was not until 1858 that it became the authorized depository of the scientific collections of the Government, and it was not until after 1876 that it was officially recognized as the National Museum of the United States.

But for the provident forethought of the Smithsonian Institution, the United States would probably still be without a reputable nucleus for a national museum.

The relations of the Museum to the system of popular lectures, for many years established in Washington, which replaces the old Smithsonian courses, once so influential, and the assistance which it affords each year to students of science, is referred to elsewhere in this report.

The Institution publishes many circulars giving information on scientific subjects, which are distributed gratuitously to those who write to make inquiries, and this system is being continually extended. In addition to this, a large correspondence is carried on with people in search of information on scientific topics. Probably 5,000 letters a year go out to people who write seeking to know the name of some object or other scientific fact. Inquiries of this kind are always answered promptly and fully; and frequently, to intelligent inquirers, books are sent which will enable them to find out such names for themselves in future. This work has not only an educational value, but often a great economic importance as well; as, for instance, when some common mineral has been mistaken for one of value, some useless plant has been wrongly identified and supposed to be of service in medicine, or some harmless animal feared as noxious.

The publications of the Institution and its dependencies reach every State and almost every county in the United States. A careful study of the subject, recently made by the president of one of the scientific societies in Washington, seems to indicate that there are several States which are reached by no scientific publications whatever except those distributed gratuitously by the Government.

Speaking of the Smithsonian Institution proper, and not of the Museum or any other trust which it administers, it may be positively

stated that in the execution of the trust of Smithson more has been given to the Government than has been received. The machinery of the Institution's action has been such that it has incidentally, in connection with its legitimate work for the increase and diffusion of knowledge, paid over to the Government the equivalent of much more than the whole original fund.

The present Secretary has pointed out that "although by the judicious administration of the Smithson fund nearly \$1,500,000—the fruits of its investment—have been applied during the past forty years to the advancement of science and education in America (in addition to the principal, \$911,000, larger now than ever before), it should be remembered that the unrestricted income of the Institution is less than \$60,000 a year, a sum much smaller in its power to effect results than ever in previous years."

Can the United States fail to recognize its obligation to supplement liberally this private contribution for public good, especially if it be borne in mind that, as Secretary Langley has shown, the Institution has left in perpetual charge of the nation, in the Museum alone, property acquired out of its private fund, which is now more than equal in value to the whole amount of the Smithson bequest, and the value of its library, though less, is also very great.

Every museum has its special characteristics growing out of its form of organization, its location, scope, and financial and other resources. The character of the National Museum is fundamentally affected by its connection with the Smithsonian Institution, its dependence upon Congress for appropriations annually, and the necessity, under existing laws, of its caring for all collections belonging to the Government.

Of the connection of the Museum with the Smithsonian Institution, it should be said that it is in the highest degree advantageous. It should be borne in mind that it is essentially a Smithsonian museum, since, especially in its earlier history, the Institution expended large sums of money in aiding explorations, with the distinct purpose of increasing the collections in certain directions, while of late years it has deposited all the valuable gifts and bequests of specimens it has received. It has had in addition, for nearly half a century, the use of the larger portion of the Smithsonian building, and, what is of paramount importance, the guidance and influence of the officers of the Institution, and the assistance of its numerous correspondents.

C.—THE WORK OF THE MUSEUM IN PUBLIC EDUCATION.

The work of the Museum, if it only performed the functions of an institution for scientific investigation, would be of sufficient value to justify its maintenance and extension. The Museum, however, not only performs these functions, but also does a very great deal to render the resources of science available to the public at large.

The National Museum is a treasure-house filled with materials for the use of investigators, and it is also an agency for the instruction of the people of the whole country.

In a recent address before the American Historical Association, I attempted to explain the idea of our work as follows:

(1) That public institutions of learning are not intended for the few, but for the enlightenment and education of the masses.

(2) That the public has a right to full participation in the results of the work of the scientific establishments which they are helping to maintain.

(3) That one of the chief duties of the officers of these institutions is to provide means by which such results may be presented in an attractive as well as an intelligible form.

No scientific institution is more thoroughly committed to the work of the diffusion of knowledge than is the Smithsonian Institution, and no department of its activity has greater possibilities in this respect than the National Museum.

The benefits of the Museum are extended not only to the specialists in its laboratories and to the hundreds of thousands of visitors from all parts of the United States who pass through its doors each year, but also to many local institutions and their visitors, through the distribution of the duplicate specimens in the Museum, which are made up into sets, accurately named, and distributed to schools and museums.

In the next annual report it will be shown how many hundred-thousands of objects have been thus distributed during the past twenty years. Every museum in the United States has profited in this way, and by its system of exchange the Museum has, while enriching itself, contributed largely to the stores of every important scientific museum in the world.

Not only are specimens thus sent out, but aid is rendered in other ways. Within the last year many local museums in the United States were supplied with working plans of cases in use in the Museum, and similar sets of plans have been supplied within the past few years to national museums in other countries.

Not only do the people of the country at large profit by the work of the Smithsonian, as made available to local institutions, but also to a very considerable extent directly and personally.

The curator of each department in the Museum is expected to be an authority in his own line of work, and the knowledge of the whole staff of experts is thus placed, without cost, at the service of every citizen.

It is much to be regretted that many specialists, intent chiefly upon the study of certain scientific problems in which they individually are absorbed, are disposed to neglect the claims of the educated public to the enjoyment and instruction which museums afford. They do not hesitate to say that scientific museums should be administered for the benefit solely of persons engaged in research. Such men would find no welcome among us.

The experience of Europe, with its magnificent public museums and the history of the several expositions in the United States, should be quite sufficient to satisfy anyone who has studied the matter, that the museum is an educational power even more influential than the public library.

The venerable director of the South Kensington Museum, the late Sir Philip Cunliffe Owen, speaking from an experience of thirty-five years, not only in his own establishment, but in the work of building up the score of affiliated museums in the various provincial towns of Great Britain, remarked to the writer :

We educate our working people in the public schools, give them a love for refined and beautiful objects, and stimulate in them a desire for information. They leave school, go into the pursuits of town life, and have no means provided for the gratification of the tastes which they have been forced to acquire. It is as much the duty of the Government to provide them with museums and libraries for their higher education as it is to establish schools for their primary instruction.

In the same conversation, Sir Philip insisted very strongly that a museum not actually engaged in educational work of some kind could not long survive, pointing to the great system of lectures and examinations connected with the Science and Art Department of the Council of Education, of which the South Kensington Museum is one of the chief agencies.

II.—SPECIAL TOPICS OF THE YEAR.

In the present report the same general plan of arrangement has been followed as that adopted in 1893, all tables and statistical summaries being published as appendices, while matters of more general interest are presented in the body of the report. Part II consists of papers describing and illustrating collections in the Museum.

The work connected with the preparation of an exhibit for the World's Columbian Exposition was nearly finished before July 1, 1893. The operations of the Museum during the present fiscal year have been mainly along the usual lines, as will be apparent from this report. The work of caring for material returned from the Exposition has, however, occupied considerable time, and in some cases no little embarrassment has been experienced through lack of space for exhibiting or even storing the material acquired especially for the Exposition. The members of the staff will now be able to devote more time to the regular work of the Museum, and it is expected that considerable progress will be made in this direction during the coming year.

THE MUSEUM STAFF.

The designation of Mr. F. W. True was, on May 9, 1894, changed from curator-in-charge to executive curator, with special duties of administration, while he still continues to act as curator of the department of mammals.

The number of organized departments and sections in the Museum is now thirty-two. There are eight administrative divisions.¹

On July 15, 1893, Dr. C. H. White, U. S. N., honorary curator of the section of materia medica, was recalled by the Secretary of the Navy, Dr. C. U. Gravatt being detailed as his successor. Dr. Gravatt served until January 22, 1894, when he was relieved by Dr. R. A. Marmion. Medical Inspector Daniel McMurtrie was then detailed in charge of the section, having relieved Dr. Marmion on June 15, 1894.

The assistant curator of the department of comparative anatomy, Mr. Frederic A. Lucas, was formally given charge of that department on November 21, 1893, Dr. Frank Baker, who for some years has been holding the position of honorary curator, having found it impossible to serve longer in that capacity on account of the duties devolving upon him as superintendent of the National Zoological Park. Dr. Baker is now recognized as an associate curator.

On March 17, 1894, Dr. C. W. Stiles, of the Department of Agriculture, was appointed custodian of the helminthological collections,

¹A list of the scientific and administrative officers will be found in Appendix I.

and Mr. F. H. Cushing, of the Bureau of Ethnology, has been placed in charge of the Pueblo collections.

The entire collection of invertebrate fossils is now included in the department of paleontology, with the Hon. Charles D. Walcott, Director of the United States Geological Survey, as honorary curator, and Mr. Charles Schuchert as assistant curator. The names of the associate curators and custodians having immediate charge of the various sections of this department will be found in Appendix I.

Dr. Walter Hough has been appointed assistant curator of the department of ethnology, and Mr. C. W. Richmond and Mr. Wirt Tassin have been appointed to similar positions in the departments of birds and minerals, respectively. Miss M. J. Rathbun has been designated as assistant curator.

Mr. A. Howard Clark is now editor for the Smithsonian Institution, and Mr. R. E. Earll is acting as editor of the Proceedings and Bulletins of the Museum, and is also the special agent on behalf of the Museum for the Cotton States and International Exposition to be held at Atlanta in 1895.

Dr. Theodore Gill and Dr. R. W. Shufeldt are now recognized as "associates in zoology."

INCREASE IN THE COLLECTIONS.

Although the number of specimens received during the present year is placed at 171,614, more than double that for the preceding year, the grand total, 3,279,531, for the entire collection is slightly reduced, the estimate for June 30, 1893, being 3,306,020. The reason for this decrease will be readily understood when it is stated that the table which has heretofore been published, was intended only to indicate the increase in the collections of the various departments from year to year, allowance not having been made in most cases for specimens distributed or transferred to other departments. As a basis for the table published in the present report, the different curators were requested to make new estimates of the number of specimens in the collections under their charge. In some cases, however, this course was unnecessary, and in a few instances it was found impracticable to make such an estimate at the present time.

The following statement shows the number of specimens received during the year 1893-'94:

Department.	Specimens received in 1894.
Arts and industries:	
Textiles	18
Animal products.....	34
Graphic arts	270
Forestry	1
Transportation and engineering.....	19

Department.	Specimens received in 1894.
Arts and industries—Continued.	
Naval architecture.....	202
Historical collections.....	608
Musical instruments.....	138
Modern pottery, porcelain, bronzes, etc.....	39
Physical apparatus.....	75
Domestic animals.....	28
Ethnology.....	5,088
American aboriginal pottery.....	99
Oriental antiquities and religious ceremonials.....	200
Prehistoric anthropology.....	13,242
Mammals (skins and alcoholics).....	2,744
Birds.....	4,367
Birds' eggs and nests.....	4,133
Reptiles and batrachians.....	894
Fishes.....	6,200
Mollusks (including Cenozoic fossils).....	21,931
Insects.....	11,800
Marine invertebrates.....	3,684
Comparative anatomy:	
Mammals.....	
Birds.....	
Reptiles and batrachians.....	1,643
Fishes.....	
Paleozoic fossils.....	592
Mesozoic fossils.....	200
Fossil plants.....	1,000
Recent plants.....	85,000
Minerals.....	5,900
Geology.....	1,465
Total.....	171,614

The number of accessions to the Museum annually since 1881 is here presented:

Year.	Accession numbers (inclusive).	Accessions during the year.
1881.....	9890-11000	1,111
1882.....	11001-12500	1,500
1883.....	12501-13900	1,400
1884.....	13901-15550	1,650
1885 (January to June).....	15551-16208	658
1886.....	16209-17704	1,496
1887.....	17705-19350	1,646
1888.....	19351-20831	1,481
1889.....	20832-22178	1,347
1890.....	22179-23340	1,162
1891.....	23341-24527	1,187
1892.....	24528-25884	1,357
1893.....	25885-27150	1,266
1894.....	27151-28311	1,161

A list of the accessions during the year, arranged alphabetically by names of contributors and including indexes by locality and by departments in the Museum, is printed as Appendix VI.

The following table shows the number of specimens in the various departments of the Museum June 30, 1894:

Department.	Specimens ^g
Arts and industries:	
Materia medica.....	6,317
Foods.....	1,111
Textiles.....	3,306
Fisheries.....	10,080
Animal products.....	3,028
Graphic arts.....	1,704
Forestry.....	726
Transportation and engineering.....	1,793
Naval architecture.....	802
Historical collections.....	29,998
Musical instruments.....	1,219
Modern pottery, porcelain, bronzes, etc.....	3,583
Paints and dyes.....	197
Physical apparatus.....	366
Oils and gums.....	} 1,112
Chemical products.....	
Domestic animals.....	162
Ethnology.....	<i>a</i> 423,000
American aboriginal pottery.....	33,293
Oriental antiquities and religious ceremonials.....	4,145
Prehistoric anthropology.....	153,424
Mammals (skins and alcoholics).....	12,948
Birds.....	<i>b</i> 73,325
Birds' eggs and nests.....	58,041
Reptiles and batrachians.....	34,215
Fishes.....	125,000
Vertebrate fossils.....	1,595
Mollusks (including Cenozoic fossils).....	510,256
Insects.....	610,000
Marine invertebrates.....	520,000
Comparative anatomy:	
Osteology.....	} 14,828
Anatomy.....	
Paleozoic fossils.....	95,631
Mesozoic fossils.....	89,493
Fossil plants.....	113,685
Recent plants.....	252,111
Minerals.....	<i>c</i> 25,431
Geology.....	<i>d</i> 63,606
Total.....	3,279,531

a The reduction in the total for this department is due to the fact that a large number of specimens have been transferred, from time to time, to the department of arts and industries. In many cases the material so transferred has formed the nucleus of a new section.

b No estimate of the number of specimens in the duplicate series can be given at this time.

c In addition there is a large quantity of material in storage.

d These figures include the duplicates, which are estimated at 12,000.

CATALOGUE ENTRIES.

The following statement shows the number of entries made in the catalogues of the various departments during the year ending June 30, 1894:

Department.	Entries.
Forestry.....	1
Textiles.....	9
Musical instruments.....	85
Transportation and engineering.....	15
Naval architecture.....	111
Modern pottery, porcelain, bronzes, etc.....	29
Animal products.....	22
Graphic arts.....	270
Domestic animals.....	28
Ethnology.....	1,421
American aboriginal pottery.....	49
Prehistoric anthropology.....	19,674
Mammals.....	11,113
Birds.....	4,366
Birds' eggs and nests.....	1,153
Reptiles and batrachians.....	895
Fishes.....	876
Mollusks (including Cenozoic fossils).....	2,563
Insects.....	163
Marine invertebrates.....	649
Comparative anatomy:	
Mammals.....	
Birds.....	
Reptiles and batrachians.....	
Fishes.....	1,003
Paleozoic fossils.....	424
Mesozoic fossils.....	49
Fossil plants.....	125
Recent plants.....	693
Minerals.....	2,330
Total.....	48,116

APPROPRIATIONS FOR 1894-95.

For the fiscal year ending June 30, 1895, the amount appropriated for the maintenance of the Museum is \$183,100, an increase of \$16,100 over the appropriation for the year covered by this report. The items are given below:

Preservation of collections.....	\$143,000
Furniture and fixtures.....	10,000
Printing (labels, Proceedings, and Bulletins).....	11,000
Binding.....	1,000
Heating and lighting.....	13,000
Repairing and resetting boilers.....	4,000
Rent of workshops.....	600
Postage.....	500
Total.....	183,100

FOREIGN EXCHANGES.

Special reference to the principal exchanges with foreign museums and individuals is here made:

Ethnology.—Polynesian ethnological objects, photographs of Polynesian clubs, and a kapa cloth from Easter Island have been sent to the Bernice Pauahi Bishop Museum, Honolulu, Hawaiian Islands (Mr. William T. Brigham, curator), in return for material already received.

The biblical department of the Kwansei Gakuni Mission Institute, Kobé, Japan, through Rev. J. C. Calhoun Newton, transmitted a collection of photographs, documents, models, figures, etc., relating to religion and the religious history of Buddhism and Christianity in Japan, for which an equivalent will be forwarded.

Prehistoric anthropology.—Casts of American aboriginal stone implements have been forwarded to the Manchester Museum, Manchester, England (Mr. William E. Hoyle, curator), in continuation of an exchange.

From Mr. T. H. Powell, London, England, have been received stone implements, for which an equivalent will be transmitted.

Mme. J. Matheron Seveille, Grand Pressigny, Indre-et-Loire, France, sent two worked flint flakes. Two flint arrow-heads have been transmitted in return.

Prehistoric stone implements and a collection of casts of stone implements have been transmitted to the Trocadéro Museum, Paris, France (Dr. E. Hamy, curator).

Mr. W. L. Williamson, Brown's River, Hobart, Tasmania, has transmitted flint implements, for which an equivalent has been returned.

Birds.—Birds' skins have been forwarded to Mr. W. Eagle Clark, Edinburgh Museum of Science and Art, Edinburgh, Scotland, in exchange for material already received.

Twenty birds' skins were received from the National Museum of Salvador, Republic of Salvador, through Dr. Carlos Castro, secretary, as the first installment of an exchange of natural history and ethnological specimens, for which an equivalent will soon be prepared and transmitted.

To Mr. Ludwig Molnár, Molna Szecsöd, Egyházos, Hollós, Hungary, has been sent a collection of birds' skins in return for specimens already received.

From Prof. Alfred Newton, Magdalen College, Cambridge, England, have been received birds' skins from Mauritius, Rodriguez, and Anjuan Islands. These specimens were received in exchange for material already forwarded by the Museum, and in continuation of exchanges.

Fishes.—A specimen of blind fish (*Amblyopsis spelæus*) has been sent to Prof. A. Dugès, Guanajuato, Mexico.

Reptiles and batrachians.—From the Museum of Natural History, Paris, France, have been received reptiles and batrachians from Asia and Africa, in continuation of exchanges.

Mollusks.—From Mr. C. F. Ancey, administrator-adjoint, Dra-et-Mizan, Algeria, have been received two rare specimens of fresh-water bivalves and thirty species of shells, obtained principally from Africa and New Caledonia.

Mr. André C. Bonnet, Paris, France, transmitted Miocene fossils, representing one hundred and seventy-five species collected at Pontlevoy, France. Tertiary fossils have been forwarded in return.

From Mr. George F. Harris, London, England, have been received Miocene fossils, representing two hundred and thirty-one species, as the first installment of a return for Claiborne marl previously sent.

Mr. W. L. Williamson, Brown's River, Hobart, Tasmania, transmitted one hundred and nineteen specimens of marine shells, for which an equivalent has been forwarded.

Insects.—From the Technological Museum, Sydney, New South Wales, have been received twelve species of Australian Thynnidæ.

Mr. Pierre A. Warezow, of Aschabad (Nertschinsk), Siberia, Russia, transmitted a collection of East Siberian and Carabid beetles, for which an equivalent will be forwarded.

Marine invertebrates.—From the Australian Museum, Sydney, New South Wales (Dr. Edward P. Ramsay, curator), have been received echinoderms, in continuation of an exchange.

From Mr. Charles Chilton, Port Chalmers, New Zealand, have been received sixty-one specimens of crustaceans, for which an equivalent will be forwarded.

From the Manchester Museum, Manchester, England (through Mr. William E. Hoyle), have been received British invertebrates, representing thirty-four species, obtained principally from the Firth of Clyde, in continuation of an exchange.

Four species of west coast crabs have been transmitted to Dr. C. F. Newcombe, Provincial Museum, Victoria, British Columbia, in return for material already received.

From Mr. W. L. Williamson, Brown's River, Hobart, Tasmania, has been received a hermit crab, for which an equivalent has been returned.

Comparative anatomy.—From the Australian Museum, Sydney, New South Wales (Dr. Edward P. Ramsay, curator), have been received a skeleton of *Graculus melanoleucus* and two skins each of *Graculus varius*, *Graculus melanoleucus*, and *Graculus sulcirostris*, in continuation of exchanges.

Invertebrate fossils.—A large collection of invertebrate and vertebrate fossils, also fossil plants, constituting a portion of the exhibit of the department of mines and agriculture of New South Wales at the World's Columbian Exposition, has been received. A collection of characteristic North American fossil invertebrates and plants from the more important geological terranes has been forwarded in return.

A small collection of Cretaceous *Aucella* has been forwarded to Prof. A. Pavlov, Moscow University, Moscow Russia, in exchange for Russian species of the same genus.

Botany.—From the National Museum of Costa Rica, San José; have been received dried plants, in continuation of exchanges.

Prof. S. E. Lassimonne, Yseure (Allier), France, has transmitted plants from the interior of France. Herbarium specimens have been forwarded in return.

Minerals.—A collection of minerals has been received from the Queensland Museum, Brisbane, New South Wales (Mr. C. W. De Vis, curator), for which an equivalent has been sent.

Geology.—From Dr. Aristides Brezina, director of the Museum of Natural History, Vienna, Austria, has been received a large mass of cave gypsum from the Krausgrotte, Gams, Upper Styria.

A collection of ores from the Queensland Museum, Brisbane, New South Wales (Mr. C. W. De Vis, curator), has been received, for which an equivalent has been returned.

From the Commercial Museum, Brussels, through the courtesy of Mr. Alfred Le Ghait, of the Belgian legation, Washington, have been received specimens of coal from Belgium, in exchange for similar material transmitted by the National Museum in 1891.

Mr. B. Sturtz, Bonn, Prussia, transmitted rocks, for which an equivalent has been forwarded.

COOPERATION OF THE EXECUTIVE DEPARTMENTS OF THE GOVERNMENT.

The Executive Departments of the Government have, as usual, manifested an interest in assisting in the work of the National Museum and it is due in no inconsiderable degree to their direct aid, as well as to the encouragement which they have given to their officers, that the national collections have been so largely increased year by year. It is therefore gratifying to make mention in each report of the occasions on which such aid has been extended, and further, to express the hope that this cooperation may be continued in the future.

The Museum is under special obligations to various scientific bureaus of the Government, chief among these being the United States Geological Survey, the Department of Agriculture, and the United States Fish Commission.

The Department of State has, as usual, advanced the interests of the Museum in many ways, especially by encouraging its consular officers to make collections in natural history and ethnology. Among the officers of the Department who have identified themselves most intimately with the Museum work may be mentioned Hon. W. W. Rockhill, who has recently embodied the results of his explorations in a work entitled *Diary of a Journey through Mongolia and Tibet in 1891 and 1892.*¹ This will be issued as one of the special publications of the

¹ In addition, a paper by Mr. Rockhill on "The Ethnology of Tibet" was published in the Museum Report for 1893.

Smithsonian Institution. The Museum is also indebted to Mr. Henry W. Andrews, United States consul at Hankow, China; Mr. John M. Crawford, United States consul at St. Petersburg, Russia; Mr. Lewis Dexter, United States consul at Fayal, Azores; Mr. Augustine Heard, consul-general at Seoul, Korea; Mr. George H. Wallace, United States consul at Melbourne, Australia, and Mr. Rounsevelle Wildman, United States commissioner for the Straits Settlements at the World's Columbian Exposition.

The Treasury Department has afforded important aid to the Museum in connection with the free entry, and transfer to its custody, of material presented to the Museum by the representatives of foreign governments at the close of the World's Columbian Exposition.

Mr. H. G. Ogden, of the Coast Survey, and Mr. G. R. Sullivan, of the Bureau of Engraving and Printing, have been personally instrumental in increasing the collections.

Under the War Department reference should be made to the continued courtesies extended to the Museum by the Quartermaster's Department, in connection with the transportation of material from the Pacific Coast and other points in the more remote regions of the country. The following-named officers of the Army have aided effectively in increasing the collections: Col. Z. R. Bliss, Col. J. M. Wilson, Dr. Timothy E. Wilcox, major and surgeon; Dr. Edgar A. Mearns, captain and assistant surgeon; Capt. John G. Bourke, Capt. W. L. Carpenter, Capt. Henry Romeyn, Lieut. Harry C. Benson, Lieut. Wirt Robinson, Dr. George H. Penrose, Dr. R. W. Shufeldt, Dr. Washington Matthews, and Dr. C. E. Woodruff.

Maj. Charles Bendire, who has filled the position of honorary curator of the department of birds' eggs for many years, has been indefatigable in building up the oological collections. It is expected that the second volume of his important work, "Life Histories of North American Birds," will be ready for publication during the coming fiscal year.

The Museum is indebted to the Navy Department for continuing the detail of one of its medical officers as honorary curator of the section of *materia medica*. During the year Dr. C. H. White, Dr. C. U. Gravatt, and Dr. R. A. Marmion have served in this capacity. Medical Inspector Daniel McMurtrie was placed in charge of the collection toward the latter part of June. The following-named officers of the Navy have contributed to the collections: Lieut. H. G. Dresel, Lieut. C. F. Emmerick, Lieut. G. T. Emmons, Lieut. C. H. Harlow, Lieut. A. P. Niblack, Lieut. John F. Parker, and Ensign J. B. Bernadou.

Under the Department of the Interior the chief assistance has been received from the Geological Survey, to whose extensive cooperation reference has already been made. The collections derived from the Survey are mentioned in detail in the list of accessions (Appendix VI), and to the following officials sincere thanks are also due: Maj. J. W. Powell, Director, Mr. C. D. Walcott, Prof. F. W. Clarke, Mr.

Whitman Cross, Mr. S. F. Emmons, Mr. W. H. Dall, Dr. David T. Day, Mr. C. K. Gilbert, Prof. R. T. Hill, Dr. W. P. Jenney, Mr. R. C. McKinney, Dr. W. H. Melville, Prof. S. L. Penfield, Mr. Smith, and Mr. H. W. Turner. Dr. Z. T. Daniel, of the Indian Office, has contributed many interesting ethnological specimens.

The valuable services of Prof. O. C. Marsh, Mr. C. D. Walcott, Dr. C. A. White, Prof. L. F. Ward, and Prof. F. W. Clarke, have been continued in connection with the administration of the collections of vertebrate fossils, Paleozoic and Mesozoic fossils, fossil plants, and minerals.

The United States Fish Commission has always been in close cooperation with the Museum, and its yearly contributions are extensive and important. The material resulting incidentally from the exploration of the Fish Commission vessels is especially valuable. Prof. C. H. Gilbert, of Leland Stanford Junior University, Prof. B. W. Evermann, Mr. C. H. Townsend, the naturalist accompanying the steamer *Albatross*, and Prof. S. E. Meek have been instrumental in increasing the collections by their personal efforts.

A large number of important accessions have been received from the Department of Agriculture, many of which are the result of the personal efforts of its officers. Prof. C. V. Riley, Dr. C. Hart Merriam, Dr. George Marx, Dr. Albert Hassall, Mr. Edward Palmer, and Mr. E. W. Nelson may be especially mentioned in this connection. The department of insects, the department of botany, and the forestry collections of the Museum are under the control of officers of the Department of Agriculture, namely, Prof. C. V. Riley, entomologist; Mr. F. V. Coville, botanist, and Dr. B. E. Fernow, chief of the forestry division. The Museum is under obligation to the Secretary of Agriculture for permitting the continuance of the services of these gentlemen in an honorary capacity.

The Bureau of Ethnology is one of the branches of the Smithsonian Institution, and through its activities much valuable ethnological material has been obtained. Special assistance has been rendered in this connection by Maj. J. W. Powell, Director; Mr. F. H. Cushing, Mr. Gerard Fowke, Mr. H. W. Henshaw, Dr. W. J. Hoffman, and Mr. James Mooney.

COLLECTORS' OUTFITS.

Outfits have been furnished to collectors during the year as follows:

To Dr. R. P. Bigelow, Kingston, Jamaica; to Mr. J. E. Benedict, of the National Museum, who was engaged for a time in collecting in Florida; to Dr. E. A. Mearns, U. S. A., of the International Boundary Commission; to Mr. Frank X. Holzner, Fort Huachuca, Ariz.; to Mr. Charles H. Townsend, Beatty Station, Westmoreland County, Pa.; to Rev. P. H. Sorensen, Egedesminde, North Greenland; to Prof. T. D. A. Cockerell, New Mexico College of Agriculture, Las Cruces, N. Mex.; to Mr. H. G. Hubbard, Plymouth, Montserrat, West Indies; to Prof.

William Trelease, director of the Missouri Botanical Garden, St. Louis, Mo., for use during his trip to the Azores, and to Mr. Ernest Owsley, Glasgow, Ky.

In the review of work in the scientific departments and in the accession list reference is made to material received from the collectors here mentioned.

DEVELOPMENT AND ARRANGEMENT OF THE EXHIBITION SERIES.

The return of the material exhibited by the National Museum at the World's Columbian Exposition has led to a general rearrangement of the exhibition halls. Much of this material had been acquired especially for exhibition in Chicago, and in order to make room for it in the Museum, many specimens already on exhibition have been withdrawn and placed in storage.

The collections of *materia medica* have been removed from the south-east range to the northeast court. No additional historical collections have been placed on exhibition, and the coins, medals, and portraits have remained in storage during the year. The collection of personal relics of Washington has been rearranged. A notable collection of Egyptian mummy cases and other objects, presented by the Egyptian Government, has been installed in the east hall, north of the main aisle, and the collection of religious ceremonial objects has been mounted in the west hall, near the rotunda. The graphic arts collection has been removed from the north-west range to the south-east range. No important additions have been made to the exhibition series owing to the fact that the available space is already fully occupied.

The north-west range, formerly occupied by the section of graphic arts, is now devoted to American ethnology, and in the north-west court is being installed a special collection illustrating the ethnology of the Pueblos of New Mexico and Arizona. In the west hall, as heretofore, the ethnology of the eastern hemisphere is shown, and upon the walls of the lecture hall the Catlin collection of Indian paintings; here also are arranged, for the present, several groups of lay figures illustrative of certain branches of North American ethnology. A change has been made in the arrangement of the cases in the department of prehistoric anthropology, and the aboriginal pottery, formerly exhibited in the north-west court of the Museum building, has been transferred to this department. The archaeological objects from the coasts of North and South America are now arranged geographically in wall-cases, and the extreme eastern end of the hall is occupied by the prehistoric collections from Europe.

A few additional cases have been placed in the mammal hall, in connection with a general rearrangement. At the south end of the hall two new wall-cases have been constructed, and to these the Edentata, the Insectivora, and the Chiroptera have been transferred. A large series of deer antlers is now on exhibition above the wall-case on the

east side, and a series of mounted heads of large game animals has been arranged on a framework of iron and attached to the north piers. The work of preparing family labels for the exhibition series in the department of birds is in progress. In the department of fishes the exhibition series consists of five cases containing casts of fishes, and two cases of alcoholic specimens, exhibited in rectangular jars, and in addition a large number of casts arranged on the tops of cases. The exhibit illustrating economic entomology, which was prepared for the World's Columbian Exposition, is now on exhibition in the museum of the Department of Agriculture, as is also the exhibit collection of insects injurious to forestry. The systematic series has been placed in storage for lack of exhibition room. The exhibition series of the department of marine invertebrates is displayed in the west hall of the Smithsonian building. The general collection of sponges, the commercial sponges, hydroids, millepore corals, madreporarian corals, including the large and valuable collection made by the United States Exploring Expedition—gorgonian corals, echinoderms, and crustaceans are arranged in wall-cases on three sides of the hall. In the center of the hall are the mounted crustaceans and unmounted deep-sea corals, gorgonians, starfishes, and sea-urchins, contained in nine flat unit cases. The mounted gorgonians, sponges, and crustaceans are shown in unit cases. Five half-unit cases contain showy stony corals, gorgonians, and large jars of sea-lilies and other striking objects in alcohol. The synoptic series of invertebrates, prepared by Mr. F. A. Lucas and transferred to this department, occupies four door-screen cases, while two other door-screen cases are used for the nucleus of the family series of invertebrates. The specimens of this series are mounted on glass and placed in rectangular jars. The floor cases in the department of comparative anatomy have been rearranged. The additions to the exhibition series in this department consist mainly of skeletons, skulls, and sterna of birds, including some examples of various breeds of domestic fowls, as well as figures illustrating variations brought about by domestication. A plan for the installation of the Paleozoic invertebrate fossils is now under consideration and will be developed during the ensuing fiscal year. Experiments have been made with a view to the utilization of tiles for mounting fossils. The fact that tiles are cheaper than wood or paper, and will not fade or warp, is a matter of considerable importance in this connection. The arrangement carried out in the installation of the Mesozoic fossils is, primarily, stratigraphic. The biological idea is also preserved, this being made subordinate to the former.

The exhibit of the department of fossil plants is contained in five slope-top cases, the specimens being arranged geologically. On account of the limited space which it has been possible to assign to the exhibition series, only a very small portion of the collection can be shown, and those specimens which are exhibited have been selected with a

view to affording as clear a representation as possible of the floras of each geological epoch.

Much of the material in the department of minerals has been rearranged. The Isaac Lea collection of gems and gem minerals, and the Leidy collection from the United States Geological Survey, constitute important additions to the exhibition series. Printed labels have been prepared for the gem collection, and also for the Lea collection of micas and chlorites. The preparation of a special exhibit of specimens illustrating the physical and chemical properties of minerals has been begun. Under the new arrangement of the geological collections the exhibit of systematic geology is now being installed in the west-south range, and the economic collections, including the building stone collection, in the south-west court, adjoining. The principal additions to the former are the large systematic series of cave, glacial, and volcanic products which were displayed at the World's Columbian Exposition. The historical series obtained from the United States Geological Survey at the close of the Exposition has been installed in cases on the south side of the range. The foreign geographic collections, with one or two exceptions, have been broken up, and the specimens distributed through the systematic series.

LABELS.

The number of forms of labels printed on the Museum press during the year was 343, the total number of copies aggregating 42,711. This does not include large case labels, of which 64 forms—126 copies—were printed. There were also printed for the Museum at the Government Printing Office 2,650 forms, including 24 of each, and aggregating 63,600 copies.

LIBRARY.

The librarian, Dr. Cyrus Adler, reports that during the year 622 volumes were received by the Museum library, and, in addition, 2,386 parts of volumes, 854 pamphlets, and 9 maps. Some of these were given by friends of the Museum, and the remainder were obtained by exchange or purchase. From the accessions to the library of the Smithsonian Institution, which is deposited with the Library of Congress, 10,256 volumes and parts of volumes, and 1,575 pamphlets were temporarily retained for use in the Museum.

Among the more important contributions to the library during the year, especial mention should be made of the valuable contributions of Dr. L. T. Chamberlain and Mrs. Frances Lea Chamberlain. These are chiefly works relating to the natural history of the Unionidæ, and will be used in connection with the preparation of the proposed catalogue of the Isaac Lea collection.

The number of books borrowed during the year was 3,951, while 5,633 were returned. The excess of books returned over those borrowed is explained by the fact that, owing to the crowded condition of

the Museum library, the sectional libraries had been enlarged beyond the size originally contemplated, and many books which had been borrowed by curators, but not formally assigned to the sectional libraries, had been placed with them. This practice was not found advantageous, and it was accordingly deemed advisable to recall all books in the hands of curators not actually assigned to the sectional libraries. It is proposed to construct a series of cases in one of the halls of the Museum, adjacent to the library, for the reception of an exhibit of the scientific publications of the Government and of State agricultural colleges and experiment stations.

CONTRIBUTIONS OF THE YEAR TO SCIENTIFIC LITERATURE.

In Appendix VIII will be found a list of the papers published during the year by officers of the Museum and other specialists. They are, for the most part, based on collections in the Museum. The authors are 103 in number, and the list comprises 323 titles. The subjects treated upon are indicated in the following statement:

Subjects.	By Museum officers.	By other investigators.
Administration.....	3	.....
American aboriginal pottery.....	1	.....
Archæology.....	7	3
Biography.....	1	.....
Biology.....	3	.....
Birds.....	48	22
Botany.....	14	9
Chemistry.....	1	.....
Comparative anatomy.....	5	.....
Ethnology.....	9	.....
Fishes.....	15	9
Forestry.....	1	.....
Fossils.....	21	4
Geology.....	11	.....
Graphic arts.....	2	.....
Historical collections.....	1	.....
Insects.....	31	5
Mammals.....	15	3
Marine invertebrates.....	10	7
Materia medica.....	1	.....
Mineralogy.....	1	.....
Mollusks.....	20	4
Oology.....	2	.....
Oriental antiquities.....	1	.....
Physical apparatus.....	1	.....
Religious ceremonials.....	1	.....
Reptiles and batrachians.....	8	.....
Taxidermy.....	5	.....
Transportation and engineering.....	3	.....
Miscellaneous.....	11	2
Total.....	253	70

In Appendix VIII is printed a list of new genera and subgenera and a list of new species and subspecies described in publications of the National Museum issued during the year covered by this report.

PUBLICATIONS.

In a bill relating to the printing, binding, and distribution of public documents¹ it is provided that there shall be printed of the report of the Smithsonian Institution and the National Museum 10,000 extra copies, of which 1,000 copies shall be for the use of the Senate, 2,000 copies for the use of the House of Representatives, 5,000 copies for the use of the Smithsonian Institution, and 2,000 copies for the use of the National Museum.

For the fiscal year ending June 30, 1894, there was submitted to Congress an estimate of \$18,000 for printing. For the past three years this amount has been asked for. In 1892 the sum of \$15,000 was granted, but in 1893, and again in 1894, the appropriation was reduced to \$12,000, while for the year ending June 30, 1895, only \$11,000 was granted. This is a serious drawback to the operations of the Museum, as the amount of money available for printing has for several years been far too small to enable the Museum to make anything like an adequate distribution of its publications. The demand has constantly increased from year to year, and since there has been no corresponding increase in the appropriation it has, of course, been necessary to refuse a large number of worthy applications. Compliance with these requests would undoubtedly have resulted in many instances in enriching the collections of the Museum. Moreover, with a larger edition many new exchanges might advantageously be entered into with foreign museums and libraries. Aside from these considerations, however, it is believed to be a matter of the greatest importance that a copy of each work published by the Museum should be placed in every State library, college, scientific school, and normal school in the United States, as well as in local libraries of importance, and in the libraries of scientific societies.

The report for 1891 was published during the year, and also, in the form of separates, a limited edition of most of the papers contained in the appendix. The report for 1892 is nearly ready to be issued, and separate editions of the papers in the appendix have already been distributed.²

The fifteenth and sixteenth volumes of the Proceedings have appeared in bound form, and a few papers included in the seventeenth volume have been published as separates.³

¹ Approved January 12, 1895.

² In Appendix IX to this report will be found a list of the papers contained in the reports for 1891 and 1892.

³ In Appendix IX will be found a list of the papers from Volumes XV, XVI, and XVII which have been published in separate form during the year, in advance of the bound volumes.

Of the Bulletin, No. 43, entitled A Monograph of the Bats of North America, by Dr. Harrison Allen, was published during the year. An introduction to this monograph had previously been published in the Proceedings. Prof. John B. Smith's Catalogue of the Lepidopterous Superfamily Noctuidæ found in Boreal America, The Myriapoda of North America, by Mr. Charles Harvey Bollman, and Mr. William H. Ashmead's Monograph of the North American Proctotrypidæ, constituting Nos. 44, 45, and 46, respectively, have also appeared. The Fishes of North America, by Dr. David Starr Jordan and Prof. Barton W. Evermann, is in press, and will probably be issued during 1895. The second volume of the Nomenclator Zoologicus, by Dr. Leonhard Stejneger, containing a supplementary list of genera in zoology from 1879 to 1889, and a work on the Snakes and Lizards of North America, by Prof. Edward D. Cope, are also being prepared.

The second volume of the Special Bulletin, entitled "Oceanic Ichthyology," by G. Brown Goode and Tarleton H. Bean, is in press. The third, by Maj. Charles Bendire, will be a continuation of his "Life Histories of North American Birds," and will treat of the cuckoos, woodpeckers, goatsuckers, swifts, humming birds, flycatchers, horned larks, crows, jays, magpies, blackbirds, orioles, and grackles.

MATERIAL LENT FOR INVESTIGATION.

For more than forty years specimens from the Museum collections have been lent to students and advanced investigators for special study, and as the facilities of the Museum have increased, a corresponding increase in the distribution of material for scientific purposes has been made possible.

Since 1871 more than 200,000 specimens have been sent out from the Museum, principally to specialists or for educational use in colleges and schools.

During the year ending June 30, 1894, material was lent by the department of prehistoric anthropology to the Bureau of American Ethnology, for use in connection with investigations regarding the manufacture of copper sheets.

Specimens of bats of the genera *Desmodus* and *Diphylla* were sent to Dr. Harrison Allen, Philadelphia, Pa., for comparison with specimens of the same genera already in his possession, in order to determine the number of existing species. Eleven specimens of cotton-rats, mostly Mexican forms, were sent to Dr. J. A. Allen, of the American Museum of Natural History, New York City, for examination. The type specimen of *Arvicola edax* was also sent to Dr. Allen for study. Six specimens of pouched gophers were lent to Dr. C. Hart Merriam, of the Department of Agriculture. To Mr. S. N. Rhoads, of the Academy of Natural Sciences of Philadelphia, eighteen specimens of cacomistles were sent for study. Thirty-eight specimens of meadow mice, from Alaska, were lent to Mr. E. W. Nelson, of the Department of Agriculture.

Thirty-two specimens of the genus *Megascops*, an example of *Beterus gularis yucatanensis*, from Louisiana, and typical specimens of *Tympanuchus Attwateri* and *Geothlypis poleocephala Ralphi* were sent to Mr. William Brewster, Cambridge, Mass., for examination by the committee on classification and nomenclature of the American Ornithologists' Union. South American birds of various kinds were sent to Mr. Frank M. Chapman and Dr. J. A. Allen, of the American Museum of Natural History, New York City, to aid in the identification of material from Trinidad. Specimens of petrels were sent to Mr. Osbert Salvin, London, England, for use in connection with the preparation of a catalogue of the Procellariidæ in the British Museum. Ornithological material, including twenty-four specimens of Old World rails, was sent to Mr. Witmer Stone, of the Academy of Natural Sciences of Philadelphia; a hybrid duck to Mons. A. Suchetet, Goderville, France, for use in connection with the preparation of an exhaustive work on hybrid birds; a specimen of broad-winged hawk to Mr. Arthur T. Wayne, Mount Pleasant, S. C., for comparison with other specimens from Florida; specimens of pigeons to Count T. Salvadori, London, England, and other material to Mr. A. W. Anthony, San Diego, Cal., and Mr. S. N. Rhoads, Philadelphia, Pa.

Fourteen specimens of turtles and a number of skulls were sent to Dr. G. Baur, of the University of Chicago. This material was also studied by Dr. W. E. Taylor, who is connected with the same institution. A large number of specimens has been transmitted to Prof. E. D. Cope, of Philadelphia, Pa., for study and illustration in connection with his forthcoming work on the snakes and lizards of North America, which will be published by the Museum. Three specimens of lizards were forwarded to Dr. Charles H. Gilbert, of the Leland Stanford Junior University, for comparison with California specimens. Dr. J. C. Merrill, U. S. A., of the Army Medical Museum, obtained the loan of certain specimens for illustration, in connection with his lectures on poisonous snakes.

Specimens of Scorpænid fishes were sent to Prof. C. H. Eigenmann, of Indiana University, for study in connection with a review of the family. Fishes, collected by the United States Fish Commission in the Columbia River Basin and in the North Pacific, were sent to Dr. Charles H. Gilbert, of the Leland Stanford Junior University. Prof. E. Ray Lankester, Oxford, England, obtained the loan of specimens of *Branchiostoma* for study, and fishes of the genera *Chimera* and *Hydrolagus* were sent to Mr. B. G. Wilder, of Cornell University.

The Odonata obtained by Mr. William Astor Chanler during his first East African expedition were sent for study and report to Mr. Philip P. Calvert, of the Academy of Natural Sciences of Philadelphia; and to Mr. William J. Fox, of Philadelphia, some types of Hymenoptera were transmitted for use in connection with the preparation of a monograph of the family Laridæ. Twenty-four specimens of African Lepi-

doptera were lent to Dr. W. J. Holland, of the University of Pennsylvania, for illustrative purposes. Fifty-five species of Geometridæ were transmitted to Dr. George Hulst, Brooklyn, N. Y., for identification, and various lots of Arachnida have been studied and reported upon by Dr. George Marx, of the Department of Agriculture. Prof. A. P. Morse, of Wellesley College, was assisted in his study of the genus *Spharagemon* by material sent to him from the Museum. The collection of Ceutophili was lent to Dr. S. H. Scudder, of Cambridge, Mass., for use in connection with his revision of the group. To Prof. John B. Smith, of New Brunswick, N. J., who is engaged in monographic work upon the Deltoids, was accorded the use of material in the department of insects. Specimens of Lepidoptera were sent to Prof. J. W. Spergel, Giessen, Germany.

Three species of crabs and some crayfishes were lent to Prof. Walter Faxon, Museum of Comparative Zoology, Cambridge, Mass., for use in connection with the preparation of a report on the Crustacea collected by the United States Fish Commission steamer *Albatross* on a cruise to the Galapagos Islands in 1891. To Prof. F. H. Herrick, Adelbert College, Cleveland, Ohio, a number of small lobsters were transmitted for use in connection with certain special investigations. Sponges from Bering Sea, collected by Dr. W. H. Dall and others, were transmitted to Mr. Lawrence M. Lambe, of the Geological Survey of Canada, for identification.

The pterylosis of the owls and *Caprimulgi* has been studied by Mr. Hubert L. Clark, of Pittsburg, Pa., and material from the Museum collections was sent to him in this connection.

Anatomical material was lent to Prof. H. F. Osborn, American Museum of Natural History, New York City, for comparison, and a number of specimens of alcoholic birds were sent to Dr. Max Fürberger, Jena, Germany, for use in connection with his studies of the muscular and nervous systems.

Eleven specimens, including four species, of Cretaceous Echinoidea were lent to Prof. W. B. Clark, of Johns Hopkins University, for use in preparing a supplement to his monograph of the Mesozoic Echinodermata of the United States. Six species of cephalopods were sent to Prof. Alpheus Hyatt, of the Boston Society of Natural History.

Specimens of the genus *Prunus* were sent to Prof. L. H. Bailey, Ithaca, N. Y., for use in a horticultural revision of the plums. Specimens of Gramineæ have been sent to Prof. W. J. Beal, Agricultural College, Mich., for use in connection with the preparation of his work on the Grasses of North America. Mrs. Katharine Brandegee, of San Diego, Cal., used a portion of the Museum collection of *Ceanothus* in preparing a monographic revision of that genus. The collection of Cactaceæ and specimens of the genus *Amaranthus* have been used by Prof. J. M. Coulter, of Lake Forest University, in connection with his monographic work. Miscellaneous specimens of the order Sapindaceæ

were sent to Prof. L. Radlkofer, Munich, Bavaria. Specimens of *Polygonum* were sent to Mr. J. K. Small, Columbia College, New York City. Many specimens of plants from tropical America have been sent to Capt. John Donnell Smith, Baltimore, Md., for use in connection with the preparation of his work on the flora of Guatemala. To Prof. William Trelease, of the Missouri Botanical Garden, St. Louis, specimens of the genera *Acer*, *Gayophytum*, and *Sagittaria* have been sent for use by himself or his associates in revisions of these groups.

Geological material has occasionally been lent to the Columbian University for use in class work, and a small lot of thin sections of rocks were sent to Prof. A. A. Wright, curator of the museum at Oberlin College, for study.

Applications are frequently received for plans showing the construction of cases used by the Museum, and during the year blue prints or photographs of standard cases have been sent to a large number of institutions and individuals.

WORK OF STUDENTS AND INVESTIGATORS AT THE MUSEUM.

In addition to the facilities afforded to investigators outside of Washington, Museum material has been made use of by a number of persons who visited the building during the year for the purpose of studying some special group.

Mr. Stewart Culin, of the University of Pennsylvania, studied the collection of games and gambling devices from various parts of the world, and through his efforts many of the duplicates have been exchanged for new specimens, thus adding materially to the value of the collection. Mr. Culin prepared a paper entitled "Chinese Games with Dice and Dominoes," which was printed in the Report of the Museum for 1893. Mr. F. H. Cushing, of the Bureau of Ethnology, has been engaged in the study of American games, in cooperation with Mr. Culin, the latter, however, devoting his time more especially to Asiatic games. During the past three years Mr. Joseph D. McGuire, of Ellicott City, Md., has spent much time in the Museum studying the aboriginal methods of working stone. The Hon. W. W. Rockhill, Third Assistant Secretary of State, has had access to the ethnological material from Tibet contained in the Museum collection. Some of the most valuable and interesting of these specimens were collected by Mr. Rockhill himself during his travels in Asia. He has prepared a paper entitled "Notes on the Ethnology of Tibet," which was also published in the Museum Report for 1893. Dr. J. Walter Fewkes has been accorded every facility possible for the comparison of his own collections with those of the Museum in connection with the preparation of his monograph of the Hemenway collection.

Mr. F. V. Coville, honorary curator of plants, has commenced a series of studies in the economic botany of the North American savages.

Miss Virginia Blunt, of Georgetown, D. C., spent some time in a general study of the anthropological collections.

In the department of birds the collections have been studied by **Maj. Charles Bendire**, in connection with the preparation of the second volume of his work on "Life Histories of North American Birds," to determine the breeding range of certain species; by **Mr. T. S. Palmer** and **Dr. A. K. Fisher**, of the Division of Ornithology, Department of Agriculture, in identifying specimens received at the Department; and by **Dr. Leonhard Stejneger**, of the National Museum, in connection with his studies of Japanese birds.

Prof. Barton W. Evermann studied the material in the Museum while preparing a report on the field operations of the United States Fish Commission, and also in connection with the preparation of a work on the fishes of North America, of which **Messrs. Jordan and Evermann** are the authors. This will be published as a bulletin of the National Museum. **Mr. H. M. Smith**, of the United States Fish Commission, compared material from the Great Lakes with certain specimens in the Museum. **Dr. Theodore Gill**, who is engaged in the study of the relations of the families of fishes, has had access to the ichthyological collections, as has also **Prof. S. E. Meek**, of the Arkansas Industrial University, who studied the fishes of various western states with a view to the preparation of a report thereon.

The members of the force of the Division of Entomology, Department of Agriculture, have had occasion almost daily to consult the entomological collections of the Museum. Among others who have availed themselves of this privilege, mention may be made of **Prof. Jerome McNeill**, of Fayetteville, Ark., who spent nearly three months in studying the collection of Acrididæ, and **Mr. C. W. Johnson**, of the Wagner Free Institute of Science, Philadelphia, who studied the collection of Stratyomyidæ. Both of these investigators had in view the preparation of monographs of the families referred to.

Dr. R. P. Bigelow spent several days in the department of marine invertebrates during the early part of the fiscal year, in completing a report on the Stomatopoda.

Prof. Alpheus Hyatt, of the Boston Society of Natural History, has been engaged in work of considerable importance in the department of Mesozoic fossils.

Dr. Arthur Hollick, of Columbia College, New York, was engaged for a time in the study of the flora of the Potomac region, in connection with his editorial work on **Dr. Newberry's "Flora of the Amboy Clays."**

Mr. J. M. Holzinger, Winona, Minn., spent several weeks in preparing a report on a collection of plants from northern Idaho and Washington. **Mr. J. B. Leiberger**, Hope, Idaho, spent about three months at the herbarium, making particular studies of the flora of the State of Washington. **Dr. B. L. Robinson**, of Cambridge, Mass., has critically examined the Caryophyllaceæ, in part at the herbarium at Washington, and

in part after they were forwarded to Cambridge. Mr. P. A. Rydberg, Lincoln, Nebr., spent several months at the herbarium in studying the flora of South Dakota. Prof. F. Lamson-Scribner, of the Department of Agriculture, is engaged in the preparation of a work on the grasses of the United States.

The petrographical and historical series in the department of geology have been accessible to the students of Columbian University. Prof. R. I. Packard, of this city, and Prof. S. E. Meek, of the Arkansas Industrial University, have also been engaged in investigations upon this and other material in the department.

The bibliography (Appendix VIII), contains references to a large number of papers based upon Museum material.

VISITORS.

The number of visitors to the Museum building during the fiscal year ending June 30, 1894, was 195,748, and to the Smithsonian building 103,910.

The monthly register of visitors for the fiscal year covered by this report is as follows:

Year and month.	Museum building.	Smithsonian building.
1893.		
July.....	12,041	5,549
August.....	17,497	8,166
September.....	18,499	10,394
October.....	17,755	9,403
November.....	11,322	7,225
December.....	14,429	7,461
1894.		
January.....	13,921	7,352
February.....	19,123	9,437
March.....	24,334	11,911
April.....	18,154	10,220
May.....	16,795	9,898
June.....	11,878	6,894
Total.....	195,748	103,910
Approximate daily average on a basis of 313 days in the year.....	625	332

Number of visitors to the Museum and Smithsonian buildings since the opening of the former in 1881.

Year.	Museum building.	Smithsonian building.	Total to both buildings.
1881.....	150,000	.....	150,000
1882.....	167,455	152,744	320,199
1883.....	202,188	104,823	307,011
1884.....	195,322	91,130	286,452
1885 (January-June).....	107,365	60,428	167,793
1885-'86.....	174,225	88,960	263,185
1886-'87.....	216,562	98,552	315,114
1887-'88.....	249,665	102,863	352,528
1888-'89.....	374,843	149,618	524,461
1889-'90.....	274,324	120,894	395,218
1890-'91.....	286,426	111,669	398,095
1891-'92.....	269,825	114,817	384,642
1892-'93.....	319,930	174,188	494,118
1893-'94.....	195,748	103,910	299,658
Total.....	3,183,878	1,474,596	4,658,474

EXAMINATION AND REPORT.

Large quantities of material obtained in different sections of the United States, and also from Europe, Asia, Africa, and Oceanica, have been forwarded to the Museum by correspondents during the year for examination and report. In cases where the specimens have been considered of sufficient value or interest, they have been added to the Museum collection (unless a special request for their return was made), and a reference is made to them in the accession list which constitutes Appendix VI.

During the year 478 lots (Nos. 2291-2768, inclusive) have been received. The specimens have been referred to the related departments in the Museum, and reports upon the material have been prepared by the curators or their assistants and forwarded from the office of the Assistant Secretary to the senders. A detailed statement of this material, arranged alphabetically by the names of senders, is given in Appendix VII.

MEETINGS OF ASSOCIATIONS IN WASHINGTON DURING THE YEAR.

Several of the more prominent scientific associations which have met in Washington during the year, have held their sessions in the lecture hall of the Museum.

The meeting of the first Pan-American Medical Congress was held in this city from September 5 to 8. The congress is composed of twenty-two sections, some of which held their meetings in the lecture hall of the Museum.

Mrs. A. D. Davidson, president of the National Science Club for Women, delivered an address before that organization in the Museum lecture hall on March 10.

The National Academy of Sciences has for some years held its annual meeting in the Museum building. The session for the present year lasted from April 17 to 20.¹

The use of the lecture hall was granted to the Association of Military Surgeons of the United States on the occasion of its fourth annual meeting. The association was in session from May 1 to 3.

The series of Saturday lectures was continued under the joint auspices of the Anthropological and Geological Societies of Washington. Provision was made for three courses, the lectures in each being so arranged as to give a logical introduction to some phase of the science treated.²

The following table indicates the number and dates of Saturday lectures since 1882:

Year.	Date of first and last lecture.	Number of lectures.
1882.....	March 11, April 29.....	8
1883.....	January 13, March 31.....	12
1884.....	January 5, April 26.....	17
1885.....	February 7, May 2.....	12
1886.....	March 6, May 9.....	10
1887.....	March 12, May 7.....	12
1888.....	February 18, May 5.....	12
1889.....	March 9, May 11.....	10
1890.....	February 1, April 3.....	10
1891.....	.....	.....
1892.....	.....	.....
1893.....	March 25, May 13.....	8
1894.....	February 17, May 26.....	15
Total.....	.....	126

A very interesting course of illustrated lectures on old and modern methods of engraving was delivered in the lecture hall of the Museum by Mr. S. R. Koehler, curator of the section of graphic arts in the National Museum, and also curator of the department of prints in the Boston Museum of Fine Arts.³

ADDITIONAL MUSEUM BUILDING.

In the report of the Secretary of the Smithsonian Institution for 1883, only two years after the completion of the present Museum building, the necessity for additional space for the accommodation of the collections was clearly and fully set forth. In 1888, during the first session of the Fiftieth Congress, a bill appropriating the sum of \$500,000 for the erection of a new building was introduced in the Senate and was passed by that body on June 20, 1888, but failed to pass the House of Representatives. A bill of similar purport passed

¹ A list of the papers read before the Academy appears in Appendix X.

² For the titles of these lectures, see Appendix X.

³ The titles of these lectures will be found in Appendix IX.

the Senate during the second session of the Fifty-first Congress and again failed in the House. A third bill was introduced in the Senate by Mr. Morrill during the first session of the Fifty-second Congress. This bill was passed, and in the House was referred to the Committee on Public Buildings and Grounds, but was not reported. During the Fifty-third Congress still another bill with the same object was introduced by Mr. Morrill.

NECROLOGY.

In the early part of the present year Mrs. Frances Lea Chamberlain, of Philadelphia, daughter of the late Dr. Isaac Lea, died at Pasadena, Cal. In her death the National Museum has lost a valued friend and contributor—one who has taken a deep and active interest in its work. The large collection of fresh-water mollusks presented by Dr. Lea has received many important additions through the generosity of Dr. and Mrs. Chamberlain. By the terms of Mrs. Chamberlain's will the Lea collection of gems and quartz crystals becomes the property of the Museum.

III.—REVIEW OF WORK IN THE SCIENTIFIC DEPARTMENTS.

Previous to the year 1893 it was customary to publish in the Annual Report the reports of the curators of the scientific departments in the Museum, the chapter bearing the above heading being then confined to a statement of the most prominent features connected with the operations of the scientific departments. In the report for 1893 a change was made in this respect; the curators' reports were omitted, and the review of work in the scientific departments was extended. The information furnished by the curators in their reports regarding the development of the exhibition series under their care, as well as the lending of Museum material to investigators and students, is omitted from the present review, having already been embodied in the special chapters relating to these subjects.

DEPARTMENT OF MAMMALS.

Mr. F. W. True, curator of this department, reports that the number of accessions compares favorably with that of the preceding year, while the actual number of the specimens has been much larger. This increase is due chiefly to the collections received from Dr. Edgar A. Mearns and his assistant, Mr. Frank X. Holzner, while engaged in the survey of the Mexican boundary. These collections embrace a very large series of mammals collected along the boundary line beginning at El Paso, Tex., and will doubtless eventually be added to by further collections obtained along the line as far as the Pacific coast. All the accessions, forty-seven in number, were obtained from individuals, excepting two. Contrary to the experience of previous years, no material has been received from the departments and bureaus of the Government, with the exception of the National Zoological Park, from which source thirty-five specimens were received.

As regards the scientific value of the accessions of the year, it may be said, in general, that they contain a considerable number of rarities and representatives of at least three species not previously known.

In his report, Mr. True makes the following statement concerning the accessions which deserve special mention:

The most important collection was that of mammals of Baltistan and the Vale of Kashmir, presented by Dr. W. L. Abbott. This collection supplements one received in 1892. The two together form the basis of a paper which I have recently published in the Proceedings of the Museum (Vol. xvii, pp. 1-16). There were three new species of meadow mice, a new field mouse, a new form of the rhesus monkey, and an undescribed species of mouse of the peculiar genus *Sminthus*. The collection also included excellent specimens of the Kashmir bears, *Ursus thibetanus* and *U. Isabelinus*, and of the ibex and wild sheep.

Mr. William Astor Chanler presented a small number of mammals collected by him and Lieut. von Hohnel on the Tana River, Somali, East Africa. A new dormouse and a new mouse were included among them. (See Proc. U. S. Nat. Mus., xvi, 601-603.)

A rare Chinese antelope, *Nemorhædus caudatus*, Milne-Edwards, unfortunately not in the best state of preservation, was presented by Baron H. Sternburg.

A small but interesting collection from the Patuca River, Honduras, was the gift of Mr. H. W. Perry.

The Museum received during the year a collection of mammals made by Mr. W. Harvey Brown in Mashonaland, South Africa. It contained numerous skins of large game, such as the equine and roan antelopes, harte-beeste, kudu, rhinoceros, wart-hog, etc.

The very large collections made by Dr. Mearns and his assistant, Mr. Holzner (who was employed by the Museum), on the Mexican border, have already been referred to. They include very large series of all classes of mammals, both large and small, prepared with great care and fully labeled.

An excellent small collection from Alaska, presented by Mr. C. H. Townsend, contained specimens of an undescribed lemming.

The late Mr. P. L. Jouy collected extensively in Mexico, obtaining especially excellent series of Vampire bats and other forms in alcohol.

From the National Zoological Park thirty-five mammals were received during the year, of which the most important were a tapir, an antelope, a kangaroo, a dromedary, and an axis deer.

Mr. J. H. Camp forwarded an interesting series of bats from Leopoldville, Congo, West Africa.

Among the other contributors may be named Lieut. Roger Welles, jr., Mr. O. F. Cook, Mr. Walter Brett, Dr. B. H. Warren, Dr. T. H. Bean, Mr. Rollo H. Beck, Mr. F. P. Davis, Mr. A. B. Farnham, Dr. Theodore Gill, Mr. W. T. Hornaday, Mr. C. W. Richmond, and Mr. E. Schmidt.

From each of several other contributors one specimen was received. These are duly referred to in the Accession List.

The growth of this department having caused a serious overcrowding of the limited quarters assigned to it some years ago in the south hall, the offices and storage rooms for the study series have been removed to the north-east pavilion, where they now occupy the first and third floors.

From the taxidermic point of view, the general condition of the exhibition series is, on the whole, excellent. There are, however, still many important deficiencies in the series, and many of the specimens exhibited are examples of old and very unsatisfactory methods of mounting, as, for instance, the smaller rodents. The study series is now well under control.

The curator has completed a number of special investigations, the results of which have been published in the Proceedings of the National Museum. Two others are now under way. These include studies of the genus *Reithrodontomys*, and of the Mexican collection of mammals obtained by Mr. P. L. Jouy.

Material belonging to the department has been lent for study to Dr. Harrison Allen, of Philadelphia; Dr. J. A. Allen, of the American Museum of Natural History, New York City, and to Dr. C. Hart Merriam and Mr. E. W. Nelson, of the Department of Agriculture.

Regarding the future plans which the curator has in mind for the further development of and investigations connected with the collection, he makes the following statement :

I desire to see the exhibition series made more symmetrical by the addition of exotic forms, so that it may give a full and correct idea of the class Mammalia as it now exists. I think there should be at least one representative of each existing genus and subgenus. The series is lacking in a great many ways at present. The bats are very inadequately represented at present, and the insectivores scarcely less so.

The odd-toed ungulates are few in number. Tapirs, horses, etc., many rarities (often the sole representatives of families), such as *Lophiomys*, of Abyssinia; *Cryptoprocta*, of Madagascar; *Dinomys*, of Peru; *Ailuropus*, of Tibet, etc., are wanting. Special effort should be made to obtain the larger ruminants and other ungulates before they disappear entirely.

In the study series the deficiencies are much greater. Five years ago there were practically no foreign mammals in the study series. The African collections of Abbott, Chanler, Moore, Brown, and Camp help to give an idea of that continent. For Asia we have practically only Dr. Abbott's Kashmir collection and Adams's Borneo collection. Siberia, China, Tibet, India, Persia, Arabia, etc., are known only by a handful of specimens, and these generally in poor condition. There are a few Australian marsupials, and a small number of South American mammals, mostly in poor condition. This is to be regretted, as there is no large collection of foreign mammals in the United States. The student has no means of comparing American forms with foreign forms, and much work done here has therefore, in a certain sense, a provincial flavor.

The curator presents the following table showing the number of specimens now in the collection and the present condition of the catalogue of the department:

Exhibition series, June 30, 1894 (mounted).....	842
Study series, June 30, 1894.....	12, 106
<hr/>	
Total number of skins and alcoholic specimens in the collection June 30, 1894	12, 948
Number of skins and alcoholics received on deposit during the fiscal year 1894.	117

Catalogue entries.

Skins and alcoholics:

Old series—

Last entry, June 30, 1893.....	20994
Last entry, December 27, 1893.....	22475

New series (skulls included)—

First entry, December 11, 1893.....	58751
Last entry, June 30, 1894.....	60607

Skulls and skeletons:

Last entry, June 30, 1893.....	36052
Last entry, June 30, 1894.....	36861

Department of Agriculture deposit:

Last entry, June 30, 1893.....	54102
Last entry, March 14, 1894.....	58750
First entry, new book, March 14, 1894.....	63501
Last entry, June 30, 1894.....	65818

Total number of entries..... 11, 113

NOTE.—The new series of numbers begins with 50001. The regular series of specimens and the Department of Agriculture deposit are entered in the same set of

catalogues; hence the complicated, but not confused, interrelation of numbers. The new series reads thus:

- Vol. I. 50001-54050, Department of Agriculture deposit.
- Vol. II. 54051-58750, Department of Agriculture deposit.
- Vol. III. 58751-63500, National Museum regular.
- Vol. IV. 63501-68200, Department of Agriculture deposit.
- Vol. V. 68201, Department of Agriculture deposit.

DEPARTMENT OF BIRDS.

From the standpoint both of number and value the accessions to the collection of birds compare very favorably with those of the preceding year. Numerically they are nearly twice as many as were received in 1893.

The principal contributors, including only those whose contributions contained 50 or more specimens, were: Dr. W. L. Abbott, 71 specimens from Kashmir; the Government of British Guiana, 51 specimens, including several species new to the collection; Dr. George F. Gaumer, 827 specimens from Yucatan and Cozumel; the Government of Guatemala, 289 specimens, several of which are new to the collection; the International Boundary Commission, several collections, aggregating 2,168 specimens, obtained by Dr. Edgar A. Mearns and Frank X. Holzner from the Mexican boundary line in Arizona, California, and Sonora; the Government of Japan, 128 specimens. Large and valuable collections obtained by Messrs. Charles H. Townsend and Barton W. Evermann from the Galapagos, Cocos Island, Mexico, Hawaii, Bering Island, and Alaska, were deposited by the United States Fish Commission. A complete reference to all the accessions of the year will be found in one of the indexes to the Accession List.

The curator, Mr. Robert Ridgway, has prepared the following list of private collections of birds, containing more than 1,000 specimens, which have been presented at various times to the National Museum:

Prof. Spencer F. Baird, 3,847 specimens from North, Central, and South America, Europe, and other regions.

Dr. W. L. Abbott, 1,676 specimens from East Africa, Madagascar and neighboring islands, India, Kashmir, and other localities.

Lyman Belding, 1,493 specimens from California, Lower California, Guadeloupe, and Cerros Island.

Dr. Elliott Coues, 2,383 specimens from Arizona, Labrador, North Carolina, and District of Columbia.

Prof. William M. Gabb, 1,093 specimens from Costa Rica, Haiti, and San Domingo.

Dr. George F. Gaumer, 1,065 specimens from Yucatan and Cozumel.

R. McFarlane, 2,506 specimens from Arctic America.

E. W. Nelson, 2,093 specimens from Alaska and other northern regions.

Robert Ridgway, 4,477 specimens from Illinois, Indiana, Virginia, Maryland, California, and various other parts of North America.

B. R. Ross, 1,405 specimens from Arctic America.

Lucien M. Turner, 2,900 specimens, principally from Labrador, Ungava, and Alaska.

Charles H. Townsend, 1,946 specimens, chiefly from Honduras, Alaska, California, and the Galapagos Islands.

John Xantus, 2,640 specimens from Mexico and Lower California.

In addition, Mr. Ridgway in his report makes special mention of the large and valuable collections presented at various times by Dr. William H. Dall, Col. Andrew J. Grayson, Mr. Robert Kennicott, Mr. W. T. March, Mr. C. B. Riker, Mr. Osbert Salvin, Dr. C. Sartorius, Dr. A. von Frantzius, Maj. Charles Bendire, Capt. T. W. Blakiston, Mr. George A. Boardman, Dr. Henry Bryant, and Mr. Henry K. Coale.

One of the most valuable contributions to the collection of birds consists of specimens presented, on several occasions, by Mr. Audubon to Professor Baird, by whom they were transferred to the Museum collection. The exact extent of this collection can not be ascertained without a complete overhauling of the entire study series. The specimens can, however, be readily distinguished by Mr. Ridgway whenever he may find time to make an inventory of them.

The systematic rearrangement of the storage collection has been continued, and will be carried on as fast as the necessary cases and trays can be supplied.

Among the special investigations being carried on, but not yet completed, are the identification of the collection from Kilima-njaro, presented by Dr. W. L. Abbott, and a comprehensive review of the Galapagos avifauna.

Mr. Ridgway has found time to complete the identifications of a large number of specimens, resulting in the publication of numerous papers in the Proceedings of the National Museum.

Papers, wholly or partially based on Museum material, have also been published during the year by Maj. Charles Bendire, Mr. Frank M. Chapman, Mr. William Brewster, Mr. Edwin M. Hasbrouck, Mr. F. A. Lucas, Mr. Samuel N. Rhoads, Dr. Leonhard Stejneger, Dr. R. W. Shufeldt, Mr. Witmer Stone, Mr. R. Bowdler Sharpe, and several other collaborators.

During the year specimens were lent for study to a large number of specialists. This matter will be referred to more in detail in another part of this volume.

The curator has outlined a number of important matters tending to the further development of the department, which he hopes to take in hand as opportunity may permit.

The total number of specimens in the collection is now 73,325, not counting the duplicate series.

The last entry in the catalogue in the preceding year was 128852, and in the year covered by this report, 133218.

DEPARTMENT OF BIRDS' EGGS.

Under the curatorship of Maj. Charles Bendire, U. S. A., retired, the collections of this department have continued to increase, and their present condition attests the excellent manner in which they have been cared for.

During the year 4,133 specimens have been added, an increase of about 1,200 over the previous year.

The principal contributor was Dr. William L. Ralph, of Utica, N. Y., to whose generous gifts is due, in so large a degree, the present extent of these collections. From him have been received during the year 614 sets of eggs, embracing 2,222 specimens (representing 212 species), and 61 nests. For more than twenty years Dr. Ralph has been collecting the eggs and nests of North American birds, and for several years he has made most valuable additions to these collections in the Museum.

Another important gift is that made by Dr. W. L. Abbott, of Philadelphia, from whom has been received an interesting collection of eggs from Aldabra and adjacent islands in the Indian Ocean, and another from the Vale of Kashmir. Several of the specimens are new to science, and very few of them were previously represented in the collection.

Lieut. Wirt Robinson contributed an interesting collection of eggs, chiefly from Virginia and Florida, consisting of 237 specimens. Several of these also were new to the collection, as well as to science.

From the Department of Agriculture was received, through Dr. C. Hart Merriam, a collection of 92 eggs and 14 nests from Mexico and western North America, containing several species new to the collection.

Collections of importance were also received from Mr. H. W. Henshaw, Dr. E. A. Mearns, of the International Boundary Commission, and the United States Fish Commission, the latter consisting of 87 eggs and 9 nests from Alaska.

Besides these, contributions have been received from more than forty other sources, all of which are referred to in the accession list.

It is most gratifying to state that all the accessions of the year have been already carefully catalogued, measured, labeled, and laid away in cases.

Very little space can at present be afforded for the exhibition series, but the few cases which have been prepared for display, containing 1,491 eggs and 235 nests, are very effective and interesting. As may be gathered from what has already been said, the reserve or study series (consisting of 41,244 specimens of eggs, with 8,350 duplicates, of North American birds; 4,646 eggs of foreign birds, with 50 duplicates, and 2,025 nests of North American birds) is in an entirely satisfactory condition.

Major Bendire has continued his work on the second volume of *Life Histories of North American Birds*, and the illustrations will shortly be ready for the lithographers. It is expected that the manuscript will be transmitted to the printer during the winter.

Two papers have been published by the curator during the year, one a description of a new subspecies of prairie hen, *Tympanuchus americanus Attwateri*; the other, a description of nests and eggs of some new birds collected on Aldabra Island by Dr. W. L. Abbott.

The curator's report closes with the following table, showing the exact number of eggs and nests in the collection, as well as the number of entries which have been made in the catalogue during the year:

Number of specimens in North American series.....	41, 244
Duplicates.....	8, 350
On exhibition.....	1, 491
Total.....	51, 085
Number of species and subspecies in North American series.....	841
Number of specimens in foreign series.....	4, 646
Duplicates.....	50
Total.....	4, 696
Number of species in foreign series.....	652
Number of nests in North American series.....	2, 025
On exhibition.....	235
Total.....	2, 260
Last catalogue entry June 30, 1893, 25935.	
Last catalogue entry June 30, 1894, 27088.	

DEPARTMENT OF REPTILES AND BATRACHIANS.

The scientific value of the accessions received during 1894 compares favorably with that of those acquired in the previous year, and the collections obtained during this year yielded not only a number of new species, but have also afforded some very important information as to the geographical distribution of species.

Dr. Leonhard Stejneger, curator, states that the principal contributions of the year were:

Large collections from Texas and the Mexican boundary in New Mexico and Arizona, transmitted by Dr. Edgar A. Mearns, U. S. A., of the International Boundary Commission; a collection obtained in Ecuador by Mr. Mark B. Kerr; a small but valuable collection forwarded from the Congo Free State, in South Africa, by Mr. J. H. Camp; specimens of three species from Florida, collected by Dr. Einar Lönnberg, of Upsala, Sweden; and a collection of turtles, containing the type specimens of *Pseudemys alabamensis*, presented by Mr. Gustave Kohn, of New Orleans, La. From the United States Fish Commission were received large collections from Tennessee, Nebraska, and other localities. Among other contributors to the collection were Mr. A. W. Anthony, San Diego, Cal.; Mr. Lyman Belding, Stockton, Cal.; Mr. Herbert Brown, Tucson, Ariz.; Mr. Theo. D. A. Cockerell, Las Cruces, N. Mex.; Mr. H. W. Henshaw, while traveling in California; Mr. Julius Hurter, St. Louis, Mo.; Mr. Earl B. Silvers, Jersey City, N. J.; Mr. C. H. Tyler Townsend, Kingston, Jamaica; Mr. W. C. Avery, Greensboro, Ala., and Prof. Charles H. Gilbert, Leland Stanford Junior University.

It is gratifying to state that the assignment of more convenient quarters for the collection has rendered possible a better arrangement and more satisfactory work in connection with the preservation of the specimens. It is unfortunate that no exhibition space can yet be provided for this department, with the exception of a small part of the west wing of the Smithsonian building, where three large groups of casts and mounted specimens, together with a number of separate plaster casts, are displayed.

The study series is now stored in the new quarters on the second floor of the north-east pavilion in the Museum building, and consists almost entirely of alcoholics contained in glass jars and tanks. The North American series is arranged by species, while the exotics are classified geographically. Notwithstanding the loss of time necessitated by the removal of the collection to its new quarters, Dr. Stejneger has accomplished a great deal of scientific work on the collections. He has described several new species, and has plotted on maps the geographical distribution of the Crotalid and Elapid snakes of the United States. He has also completed a paper on "The Poisonous Snakes of North America," which was published in the Report for 1893, and has commenced a study of the reptiles and batrachians of Japan and adjacent countries, with a view to the elaboration of a complete manual to the herpetology of that region.

The curator has formulated in his report the following plan of special work, to be undertaken as opportunity may permit:

(1) To perfect the series of North American reptiles and batrachians by the gathering of material from unexplored regions of the United States, so that this series may maintain its claim to be the best and largest in existence.

(2) To extend these investigations into the countries south of the United States as a basis for a future work upon their herpetological fauna, paying special attention to that of Mexico, Central America, and the West Indies.

(3) To gather a representative series of the species inhabiting the coasts and islands of the North Pacific Ocean, so as to form a basis for a reliable comparison with those inhabiting our own continent.

(4) To obtain a series of representative species of every genus of reptiles and batrachians found in other parts of the world.

(5) To devise improved methods of preservation, a problem to which the curator has devoted considerable thought, and for the solution of which he proposes to institute a series of experiments.

The present condition of the collection is thus stated by Dr. Stejneger in his report:

	Specimens.
Reserve series.....	19, 096
Duplicate series.....	8, 705
Unassorted and exotics.....	6, 313
Exhibition series (casts):	
Separate specimens.....	53
Specimens in groups.....	48
	— 101
Total.....	34, 215

The last catalogue entry in June, 1893, was 20493, and in June, 1894, 21388.

DEPARTMENT OF FISHES.

The scientific value of the accessions received in 1894 is considerably greater than that of the collections received during the previous year, although somewhat less in number.

The most important collections are those obtained from the coasts of Alaska, California, and British Columbia, and in the Gulf of California and the lower Colorado River by the United States Fish Commission steamer *Albatross*. Next in importance are the collections of Mexican fishes presented by the Mexican commission, through Señor Fernando Ferrari-Perez, general secretary of the commission, and the collection of Japanese fishes presented by the Japanese commission, through the United States Fish Commission, at the close of the World's Columbian Exposition.

An important accession consisting of fishes collected in Korea and on the Tsu-Shima Island by Mr. P. L. Jouy, was acquired by purchase. In addition, a number of other interesting contributions to the collections were received, and reference to each of them will be found in the accession list.

Although no explorations have been carried on by the Museum directly, valuable additions of material from the North Pacific have been obtained as the result of the work of the United States Fish Commission steamer *Albatross*, as well as from the western states and territories by agents of the Commission.

The Department of Agriculture has contributed the results of explorations in Mexico by Messrs. Nelson and Goldman, and the collections made there by Señor Herrera and Prof. A. Dugès, as well as those obtained by Dr. Edgar A. Mearns, U. S. A., of the International Boundary Commission, are well worthy of mention.

Mr. J. H. Camp transmitted some interesting fishes from west central Africa, and a collection of fishes obtained by Leonardo Fea, of Genoa, during his explorations in Burmah, was acquired by purchase.

Mention should be made of the courtesy of Mr. Henry C. Ford, president of the Pennsylvania Fish Commission, in giving Mr. C. H. Townsend a permit to haul a seine in the waters of Westmoreland County, Pa., for the purpose of obtaining specimens for the National Museum.

Dr. T. H. Bean, the honorary curator, has had but little opportunity for active work on the Museum collections, owing to his duties connected with the Fish Commission, and the care of the collection has for the most part devolved upon Mr. Barton A. Bean, assistant curator of the department. Dr. Bean, has, however, continued to some extent to work upon deep-sea fishes, and has also studied, with Mr. Charles H. Townsend, the Alaskan fishes obtained by the steamer *Albatross*.

Several small collections have been examined and reported upon, such as the fishes of Vera Cruz, received from Prof. A. L. Herrera, of the National Museum of Mexico; a small collection of Floridan fishes

made by Dr. Einar Lönnberg, of Upsala, Sweden, and a collection of Canadian fishes received from Philip Cox, of New Brunswick. The curator and the assistant curator have prepared papers describing several new flounders, as well as new species of *Bleekeria* and *Gobioides*, and work upon a report of the fishes collected by Dr. Leonhard Stejneger and Mr. N. Grebnitzki at the Commander Islands has progressed satisfactorily.

Fourteen papers, based on the collections, have been published during the year by the curator, the assistant curator, and Messrs. Gill, Eigenmann, Jordan, Evermann, Kendall, C. H. Gilbert, and H. M. Smith.

In the matter of caring for the collection, a large amount of work has been done, as is indicated in the statement quoted from the report on the operations of this department during the year:

Special attention has been given the types and otherwise unique specimens. Better jars and labels have been provided in many cases, tin tags supplied, and many of the incomplete records have been filled out.

The card catalogue of bottled collections has been brought up as far as the time would allow.

A large number of specimens have been identified and installed in their proper places.

A number of families have been rearranged, and this work will be carried forward as rapidly as possible.

The old tanks (powder tanks) have been thoroughly overhauled and mostly disposed of, about one hundred having been turned over to the property clerk. Fourteen large tanks of rotten, worthless fishes were thrown out, and fifteen tanks of duplicates were set aside.

Work has been commenced on the deep-sea material, with a view to the distribution of the duplicates.

All the receipts of the year have been placed in jars, except the extremely large specimens, and carefully preserved.

A small part of the collection is exhibited in the west hall of the Smithsonian building, and consists of five cases of casts of fishes, besides a large number of casts and two cases of alcoholic specimens displayed in rectangular jars. There are also several cases of stuffed fishes.

The value of the study series has been greatly increased by the addition of the collections already referred to, and quite a large number of types of new forms have been added to the series, as well as a number of rare species.

The collections have, as usual, been placed at the disposal of a number of investigators.

Among the special plans of work which the curator has in mind, with a view to the further development of the collections under his care, may be mentioned the increase of old world forms through exchanges with European museums, the completion of a satisfactory classification of all the Museum collections of fishes, and a more complete exhibition series of fishes.

The number of fishes in the Museum is estimated as follows:

Exhibition series	30,000
Reserve series	60,000
Duplicate series	35,000
Total	125,000

The last catalogue entry in June, 1893, was 44575, and in June, 1894 45451.

DEPARTMENT OF MOLLUSKS.

The material in this department embraces the collections of mollusks and invertebrate Cenozoic fossils. The honorary curator, Mr. William H. Dall, states that the work on the revision of the collection has been continued, and that the preparation of index sheets for each drawer in which the genera and species are contained, has advanced satisfactorily. Considerable work has also been accomplished on the collection of Tertiary fossils. The cataloguing of the duplicates has been continued, and the total number of registrations of all kinds (including the duplicates) has amounted to 3,053 entries during the year. Special reports have been prepared on collections made under the auspices of various branches of the Government service, including the United States Fish Commission, the Revenue Marine, the Department of Agriculture, and the Navy Department. Reference to the published papers relating to these collections will be found in the Bibliography. The authors of papers relating to material in this department are, in addition to the curator, Dr. R. E. C. Stearns, Mr. J. A. Singley, Mr. Charles T. Simpson, Mr. H. A. Pilsbry, Dr. C. F. Newcombe, Mr. J. D. Mitchell, Mr. J. B. Henderson, jr., and Mr. Joseph Stanley-Brown.

There has been a large increase over the previous year in the number of accessions, which amounted to 111, against 72 in 1893. Some of these are among the most valuable which have been received for several years. A complete reference to these accessions will be found in the Accession List. Valuable contributions have been received from Rev. L. T. Chamberlain, greatly augmenting the Lea collection of fresh-water and other shells. It is with deep regret that I have to record, in this connection, the death of Mrs. Chamberlain, who has so generously continued to make important additions to the collection which was presented to the National Museum some years ago by her distinguished father, Dr. Isaac Lea. I am gratified to state that Dr. Chamberlain has expressed his intention of making further contributions to this collection, and has already, since Mrs. Chamberlain's death, presented to the Museum a collection of marine shells—her personal property. This collection, known as the Lea collection, already constitutes perhaps the finest and most complete representation of the Unionidæ and allied forms in the world. In speaking here of their generous gifts to this department, it seems proper to allude also to their valuable and numerous contributions to the library, consisting chiefly of works relating to the natural history of the Unionidæ.

Among the other contributions worthy of special mention are: (1) A set of shells collected by Mr. J. B. Henderson, jr., and Mr. Charles T. Simpson, in Jamaica, during a month's expedition, the expenses of which were generously borne by Mr. Henderson; this collection required 551 entries on the register and consisted of about 3,153 specimens; (2) several contributions of shells, representing the smaller forms, from the coast of California, presented by Miss Ida M. Shepard, of Long Beach, Cal.; (3) a collection of California shells from Mr. Henry Hemphill, of San Diego, Cal.; (4) various lots of shells presented by Mr. Isaiah Greigor, of Jacksonville, Fla.; (5) a collection of fresh-water shells from Brazil and the Argentine Republic, from Dr. H. von Ihering, director of the Paulista Museum at San Paulo, Brazil; (6) shells from Texas, including some very acceptable additions to the collection, from Mr. J. D. Mitchell, of Victoria, Tex.; (7) a number of interesting species collected and presented by Dr. C. P. Newcombe, of Victoria, Vancouver Island; (8) several very fine specimens of species representing the fauna of San Pedro Bay, presented by Mr. T. S. Oldroyd, of Los Angeles, Cal.; (9) numerous interesting land shells from Lower California, obtained on an expedition sent out by the California Academy of Sciences, and presented in the name of the academy by Dr. J. G. Cooper; (10) a series of shells from the west coast of Japan, transmitted by the Rev. H. Loomis, of Yokohama, Japan; (11) collections of shells made by Dr. Edgar A. Mearns, U. S. A., in connection with the International Boundary Survey of the line between the United States and Mexico; (12) numerous photographs of the teeth of mollusks and mounted specimens of the darts of the English Helices, and also of their radulæ, presented by Mr. William Moss, of Ashton-under-Lyne, England. From the Department of Agriculture and the United States Fish Commission have been received several lots of mollusks, some being of considerable interest. Valuable collections have also been received in exchange from Mons. A. C. Bonnet, of Paris; Mr. G. H. Harris, of London, and Mr. W. L. Williamson, of Tasmania. A very acceptable collection of Madeira land shells was purchased from a local collector through the friendly offices of Hon. Lewis Dexter, United States consul at Fayal.

Assistance has been rendered to students in various parts of the country in making identifications, and directing their studies. This work necessitated extensive correspondence, no less than one hundred and fifty persons having received direct aid in this way during the year. In addition, Mr. Dall has found time to bring toward completion his work on the Tertiary fossils of Florida, besides preparing numerous reports upon and making investigations of collections of fresh-water and other shells.

The entire collection is now estimated to embrace 510,256 specimens, of which 100,000 are preserved in alcohol.

There were 2,563 entries made in the catalogues of the department during the year.

DEPARTMENT OF INSECTS.

The scientific value of the accessions received during the year is regarded by Prof. C. V. Riley, honorary curator, as far in excess of that attached to the accessions received in 1893, although in actual number they are less. The Department of Agriculture transmitted a large collection of all orders from southern California, made by Mr. D. W. Coquillet, one of the field agents of the Department. A valuable collection of Micro-hymenoptera and Hemiptera, containing numerous types, was gathered by the curator in St. Vincent and Grenada, West Indies, and has been presented by him to the Museum. A large collection from Guatemala, chiefly butterflies, was received from Dr. W. C. Shannon, of the Intercontinental Railway Commission. Mr. William Astor Chanler, of New York, forwarded a collection of insects, largely Orthoptera, collected by himself and Lieutenant von Hohnel on the Tana River, East Africa. Mr. C. F. Baker, of Fort Collins, Colo., presented a collection of 800 mounted specimens of Chalcididæ. Mr. J. H. Camp contributed a miscellaneous collection of insects from tropical West Africa.

Several collections were acquired by exchange. The insect collections have been further enriched by the results of the exploration of the West Indies by the West India Committee of the British Association for the Advancement of Science and by the explorations of the United States Fish Commission steamer *Albatross*.

The exhibit illustrating economic entomology, which was sent to the World's Columbian Exposition, is for the present installed in the museum of the Department of Agriculture, as also is a small exhibit arranged in eight unit boxes, representing insects injurious to forest trees.

The study of the large collection presented to the Museum by the Japanese Commission at the close of the World's Columbian Exposition has occupied a large share of the time of the curator and other specialists to whom parts of the collection were sent for determination. The proper study of the Coleoptera in this collection necessitated the bringing together in systematic arrangement of all the material in this order from the various foreign countries represented in the general collection. Mr. Linell has been engaged in the preparation of a paper descriptive of many new species, especially from Africa. The curator has devoted as much time as he could spare from his duties connected with his position as entomologist of the Department of Agriculture, to investigating the habits and development of the Termites, a special study of the genus *Arzama*, studies on the *Aphididæ*, *Coccidæ*, and *Psyllidæ*, and an investigation of the life habits and development of various species of all orders, especially the Coleoptera.

Material from this department has been lent for study on nine occasions during the year, and in addition a number of specialists and

other students have consulted the groups in the Museum collection in which they were especially concerned.

A number of papers based upon the collections have been published by the curator and others, and all of them are mentioned by title in the Bibliography.

Regarding the future development of this department little need be said except to quote from the report of the curator. The pressing need of more space is now a general one, and the matter has been presented over and over again in these reports, as well as in the reports of the Board of Regents of the Smithsonian Institution. Nothing, however, can be done until Congress furnishes relief. Even the anticipated addition of galleries has not been realized, the special appropriation for this purpose, which was included in the estimates for the year, not having been bestowed.

Professor Riley, says:

The curator has many hopes for the future, but in view of the limited funds reported to be available for the department of insects, and the limited prospects of any additional room becoming available, it would seem somewhat futile to suggest any plans. The crying need of the Museum at large, namely, more space, is perhaps greater with this department than with almost any other. Cases and boxes are stored and piled upon each other until it is difficult with any degree of comfort to move about the rooms, and any development or growth of the collections commensurate with the importance of a national collection is out of the question under the present restricted conditions. As a temporary expedient, the gallery already alluded to is extremely important, in order to save some of the material which we already have.

Without, therefore, any prospects of increased facilities or increased funds in the near future, we shall, I fear, soon lose the vantage ground which it has been my endeavor to give to the collections, as compared with those of other institutions in the country.

Under these circumstances, and foreseeing regretfully that the department must necessarily pass through a period of comparative stagnation so far as the collections themselves are concerned, I hope to compensate for this drawback by an increased amount of original research and investigation based upon the wealth of data already accumulated.

The present condition of the collection is indicated in the following extract from the report of the curator:

The collection contains 45,000 species in 610,000 examples. Of these, the exhibit collection contains some 18,500 and the duplicate collections about 350,000 examples. This estimate is made for June 30, 1894.

A great deal of valuable material was used in preparing the exhibit for the World's Fair, especially the exhibit of the Department of Agriculture. Much of this was from the original Riley collection, and is still on exhibition in the annex building in the Department grounds. It ought to be removed and replaced in the Museum, and not sent to Atlanta, as much of it would practically be ruined by being shipped and exhibited again among dust and crowds. The exhibit of forestry insects has also been temporarily placed with the Department of Agriculture.

While the systematic collection is in good condition, I regret to say that the exhibit material and much valuable duplicate material is threatened with serious injury, if not utter ruin, by being stored up in the halls and galleries, where it is inaccessible and subject to exceptionally unfavorable conditions.

During the year 163 entries were made in the catalogue. The last catalogue entry in June, 1893, was 1260, and in June, 1894, 1423.

DEPARTMENT OF MARINE INVERTEBRATES.

This department of the Museum remains under the care of Dr. Richard Rathbun, honorary curator, who on account of his official duties with the United States Fish Commission has not been able to devote much personal attention to the work of the department. A great deal has, however, been accomplished through the efficient assistance of Mr. James E. Benedict and Miss Mary J. Rathbun, assistant curators.

The collection has been enriched, as in previous years, by the transfer of valuable material from the United States Fish Commission, consisting of results of explorations by the steamer *Albatross* on the Pacific Coast of North America and in Bering Sea, and by Prof. B. W. Evermann and others in connection with the investigation of the Columbia River and its tributaries.

Important accessions have also been presented by Dr. R. P. Bigelow, who contributed a valuable collection of crustaceans from Kingston Harbor, Jamaica, and two species of Stomatopoda from the Bahamas; by the Mexican Commission to the World's Columbian Exposition, consisting of an interesting collection of fresh-water shrimps and crabs; by Judge Benjamin Harrison, who transmitted several small collections, chiefly of crabs, from Pensacola, Fla.; by Mr. Harlan I. Smith, who sent three lots of crayfishes and other fresh-water crustaceans from Illinois and Michigan; by Dr. J. D. Mitchell, of Victoria, Tex., from whom were received some miscellaneous invertebrates from that State; by Mr. J. H. Camp, who contributed two specimens of crabs from west central Africa, representing one new genus and two new species; by Dr. E. A. Mearns, U. S. A., of the International Boundary Commission, who made collections of crabs, crayfishes, and shrimps in connection with his surveying work; by Mr. Edward Palmer, from whom three accessions were received, the most important being a large collection of sponges from San Diego, Cal.; and by several others whose contributions are referred to in the Accession List. In addition, three important accessions were obtained in exchange, two as loans and one by purchase.

In general, it may be stated that, while the value of the accessions obtained during the year is not so great as in 1893, it has yielded a larger quantity of undescribed material.

The work of separating the collections made by the Fish Commission between 1871 and 1887, which were placed in Professor Verrill's hands many years ago by Professor Baird, has received a fresh impetus, and this tedious undertaking will, it is hoped, now be rapidly brought to a completion. Professor Verrill has devoted a great deal of labor to identifying this material, but on account of his college

duties has found it impossible to bring thoroughly under control the enormous collections of material which had accumulated as the result of the explorations engaged in by the Fish Commission during the years mentioned. Mr. Benedict spent about a month at the close of the fiscal year assisting Professor Verrill in this work, and already large collections have been received. It is confidently expected that during the next year this extensive work will be entirely completed.

From the duplicate material in the collections one hundred sets of specimens have been prepared for use in educational work, and thirty-two of these were distributed before the close of the year. The institutions thus benefited were:

Leland Stanford Junior University, Stanford University, Cal.; Dickinson College, Carlisle, Pa.; Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y.; Adelbert College, Cleveland, Ohio; Case School of Applied Science, Cleveland, Ohio; California Academy of Sciences, San Francisco, Cal.; University of California, Berkeley, Cal.; Arkansas Industrial University, Fayetteville, Ark.; Biological Laboratory, Brooklyn Institute of Arts and Sciences, Cold Spring Harbor, Long Island, N. Y.; Manchester Museum, Owens College, Manchester, England; Glen Island Museum of Natural History, Glen Island, New York; Iowa Agricultural College, Ames, Iowa; Biological Laboratory, Southwest Kansas College, Winfield, Kans.; University of Texas, Austin, Tex.; Ohio Wesleyan University, Delaware, Ohio; Central College, Fayette, Mo.; Western University of Pennsylvania, Allegheny, Pa.; Baylor University, Waco, Tex.; Central High School, Duluth, Minn.; Butler University, Irvington, Ind.; Washington Agricultural College and School of Science, Pullman, Wash.; Central State Normal School, Lock Haven, Pa.; State Institution for the Deaf, Indianapolis, Ind.; Claflin University, Orangeburg, S. C.; Atlanta University, Atlanta, Ga.; Perkins Institute and Massachusetts School for the Blind, South Boston, Mass.; Cornell College, Mount Vernon, Iowa; William Jewell College, Liberty, Mo.; Stevens Seminary, Glencoe, Minn.; High School, Bushnell, Ill.; Avon High School, Avon, Ill., and State Normal School, Emporia, Kans.

In addition, special collections, many of them as exchanges, were prepared and transmitted to the University Museum, Oxford, England; the Australian Museum, Sydney, New South Wales; the Provincial Museum, Victoria, British Columbia; Ashland City Schools, Ashland Kans.; A. A. Adee, Second Assistant Secretary of State, Washington (material for microscopic mountings); Hearst Kindergarten, Washington, D. C.; Mr. W. P. Hay, Washington, D. C.; College of the City of New York, New York City; George W. Baird, United States Navy; Miss Bettie Walden, Ashland, Clark County, Kans.

Samples of ocean bottom were transmitted for study to Prof. J. A. Ryder, University of Pennsylvania, Philadelphia, Pa.; Mr. John Hawkins, Washington, D. C.; Prof. William B. Clark, Johns Hopkins Uni-

versity, Baltimore, Md.; Mr. F. S. Morton, Portland, Me.; Mr. E. A. Gibbs, Washington, D. C.; Prof. F. H. Herrick, Adelbert College, Cleveland, Ohio, and Mr. Rufus M. Bagg, jr., Johns Hopkins University, Baltimore, Md.

A part of the study series, consisting of dried and alcoholic brachyuran crustaceans, and the collection of hermit crabs, are for the present disposed of in the north gallery of the main hall in the Smithsonian building, while other groups are arranged in the two basement rooms assigned to this department and in the hall of the west basement.

The routine work in this department is very extensive, owing to the magnitude of the collections; and the renewal of alcohol, the cataloguing of new accessions, and the continuation of the card catalogue as identifications of fresh material are completed, necessarily occupy a large portion of the time of Mr. Benedict and Miss Rathbun. They have, however, accomplished considerable work in connection with special studies of certain groups and the identification of material submitted for examination and report.

Mr. Benedict has continued his studies on the anomuran crabs, especially the Paguridæ. Miss Rathbun has been engaged in a study of the brachyurans, devoting most of her time to the Inachidæ, the fresh-water crabs, and the species of *Callinectes*.

In connection with the above work, many special collections were named, among them a large invoice of specimens from Japan, Loo Choo Islands, and Hawaiian Islands, received from Mr. Frederick Stearns; crustaceans collected by the expedition to the Bahamas made by the State University of Iowa, on which a special report is to be prepared; crustaceans collected in the Indian Ocean by Dr. W. L. Abbott; in Jamaica by Dr. R. P. Bigelow, and in the Pacific Ocean and Bering Sea by the steamer *Albatross* in 1893.

These investigations, as well as others by collaborators of the Museum engaged in the same line of work, have resulted in the publication of fifteen papers, nine of which were printed in the Proceedings of the National Museum and five in the Bulletin of the Museum of Comparative Zoology. Reference to all these papers will be found in the Bibliography.

Although the Museum has not directed any explorations worthy of special mention during the year, several of the accessions consist of collections obtained by explorations, the results of which have wholly or in part been transmitted to the Museum. In this connection the grateful acknowledgments of the Museum are due especially to the Fish Commission, to whose collections reference has already been made; the State University of Iowa, which sent an expedition to the Bahamas and Florida Keys under the guidance of Prof. C. C. Nutting; the International Boundary Commission, in connection with which Dr. Edgar A. Mearns made many important collections on the border line between the United States and Mexico; Dr. R. P. Bigelow, who collected in

Jamaica during the summer of 1893; Mr. E. W. Nelson, who made collections in southern Mexico for the Department of Agriculture; Prof. Charles H. Gilbert and other members of the staff of Leland Stanford Junior University, by whose efforts collections were obtained from the coast of southern California; Mr. J. H. Camp, who collected in west central Africa, and Dr. W. L. Abbott for material from the western Indian Ocean.

A number of specimens have been sent out for study during the year.

The curator has in view several plans for the further development of the department, which are presented in the following remarks quoted from his annual report:

It is proposed to add to the exhibition collection a series which will represent the principal features of the faunas of the Atlantic and Pacific oceans, and at the same time illustrate the work done by the United States Fish Commission. This faunal series will include deep-sea crustaceans, corals, starfishes, sea-urchins, etc.

It is also proposed to place on exhibition a larger number of alcoholic specimens. This is to be done by filling out and amplifying the family series begun for the World's Fair exhibit. Those families that are specially showy, or for any reason are unusually desirable for exhibition, it is proposed to have most fully represented, as, for instance, in the family Lithodidæ it is the plan to show all of the species in the Museum collection, because they are large and very showy, and because the collection is unequalled in any other museum.

All of the changes made are, as far as possible, to be in line with a more systematic classification.

The number of specimens added to the collection during the year is placed at 3,684, making an estimated total of 520,000 specimens now in this department.

The following table shows the number of entries made in the catalogue books of the department during the year:

Group.	Entries to—		Entries during the year.
	June 30, 1893.	June 30, 1894.	
Crustaceans.....	17815	18411	596
Worms	4967	4970	3
Bryozoans and Ascidians.....	2887	2887	.....
Echinoderms and Cœlenterates	7858	17908	50
Sponges and Protozoans.....	6326	6326	.....
Total			649

DEPARTMENT OF COMPARATIVE ANATOMY.

The work in this department during the year has largely consisted in arranging the material returned from the World's Columbian Exposition, preparing labels, and in elaborating plans for the further extension of the exhibition series.

In order to provide additional room for exhibition purposes, the lower portion of the long base on the south side of the hall has been so arranged as to accommodate unit boxes, and the floor cases have been rearranged with the same end in view. It is intended as soon as practicable to construct a gallery along the north side of the hall.

Mr. F. A. Lucas, curator, reports that among the accessions of the year the most important was a skeleton of Stearns's Grampus, *Grampus Stearnsii*. The other accessions are alluded to in the Accession List. The additions to the exhibition series have consisted principally of skeletons, skulls, and sterna of birds, including some examples of various breeds of domestic fowl, as well as figures illustrating variations brought about by domestication. The study series has gained several skeletons of birds and a considerable number of skulls and mammals.

An increasing feature of the work of this department consists in the identification of material submitted for examination and report, no less than twenty-six lots, including both recent and fossil bones, having been transmitted for this purpose during the year.

Mr. Lucas has found time to complete a memoir by Dr. Leidy on vertebrate fossils from Florida, and has also prepared a paper on "The Anatomy and Affinities of the Cœrebidæ and other American Birds." A paper on the "Weapons and Wings of Birds," by the curator, was published in the Report of the Museum for 1893. Preliminary studies of the swifts, the tyrant flycatchers, and the hypotarsus of birds have been commenced.

In the curator's report is presented the following tabular summary of the present condition of the collection, as indicated by the catalogue books of the department:

Class.	Last entry—		Increase.
	June 30, 1893.	June 30, 1894.	
Mammals:			
Old catalogue.....	36052	36861	809
New catalogue.....	49328	49381	53
Birds.....	19185	19287	102
Reptiles and Batrachians.....	29340	29362	22
Fishes.....	26159	26176	17
Total.....			1,003

To this should be added about 640 skulls of mammals which under the new system of cataloguing are entered with their respective skins.

The number of specimens in the exhibition series at the close of the fiscal year is here shown:

Skeletons:	
Mammals.....	209
Birds.....	91
Reptiles.....	39
Batrachia.....	7
Fishes.....	33
Elasmobranchs.....	3
Skulls of mammals.....	48
Skulls and sterna of birds.....	60
Other skulls.....	6
Specimens illustrating various points of morphology, structure, etc.....	215
Anatomical models.....	56
Total.....	767

PALEOZOIC FOSSILS.

Thirty-two accessions have been received, aggregating 592 specimens. Two of them were received in previous years.

Through an exchange arranged by Mr. C. D. Walcott, honorary curator, with the Department of Mines and Mining, New South Wales, the greater portion of the fossils exhibited by that Government at the World's Columbian Exposition were secured for the National Museum. The vertebrates and plants in the collection are particularly interesting. Of Paleozoic invertebrates there are 70 species, represented by 169 specimens.

A fine and extensive collection of Ordovician fossils from Wisconsin and Minnesota was transmitted to the Museum by the United States Geological Survey, through the honorary curator. This collection has been studied, but is not yet entered upon the register. Also from the same source there were received five large slabs with the trails of *Climactichnites Youngi*, from New Lisbon, Wis.

Messrs. Alfred Page and E. C. Perkins, Prairie du Sac, Wis., have, through the United States Geological Survey, donated very important Cretaceous specimens of the genera *Aglaspis*, *Dikellocephalus*, and *Illænnurus*. Some of these are the most perfect specimens of the species known.

References to the other accessions, among which may be mentioned those of Mr. J. A. Singley, Giddings, Tex.; Mr. Victor E. Phillips, Olney, Ill.; Mr. Bernhard Lundgrew, Lund University, Lund, Sweden; Mr. F. H. Williams, Greene, N. Y., and Mr. Howard Shriver, Cumberland, Md., will be found in the Accession List.

The time of the curator having been very largely occupied with the affairs of the United States Geological Survey, most of the laboratory work has been performed under the direct supervision of Mr. Charles Schuchert, assistant curator, who has paid special attention to the preparation of a catalogue of the illustrated or type specimens belonging to this department.

The plan of attaching to each of the specimens which have been illustrated, a green diamond-shaped label, indicating where the illustration may be found, has been adopted. Attention has been given toward improving the exhibit of fossils in the south-east court.

The curator has continued his investigations upon the Middle Cambrian fauna, and has also commenced the preparation of a review of the new material added to the Lower Cambrian collections since the publication of his memoir on this subject in 1891.

Four papers by the curator have been published during the year, two of them in the *American Journal of Science*, one in the *Bulletin of the Geological Society of America*, and one in the *Proceedings of the Biological Society of Washington*. These are all referred to in the *Bibliography*.

Through the cooperation of the Geological Survey, Mr. Schuchert was enabled to spend several months in the field, in the Cambrian area of Wisconsin, Iowa, and Minnesota, and at York, Pa. Large collections have been sent in, and selections made preparatory to their study. Large collections have also been received from the Cambrian series of Alabama. Forty-three boxes and three barrels of Cambrian fossils and five boxes of Carboniferous fossils from California were contributed by the Geological Survey, as well as a large quantity of material from the Yellowstone Park.

A plan for the installation of the Paleozoic fossils is now under consideration.

There have been 424 entries made in the catalogue of the department, including the numbers 24242 to 24665.

MESOZOIC FOSSILS.

The continued pressure of official duties connected with the United States Geological Survey has, as in past years, made it impossible for Dr. C. A. White, who is in charge of this collection, to devote much time to the care and installation of the material under his charge. Nor has it yet been found practicable to assign an assistant, paid by the Museum, to this section. Dr. White has been aided during the year by Mr. T. W. Stanton, who is employed by the Geological Survey and whose time is principally occupied upon work relating to the affairs of the Survey.

Although, with the exception of collections transferred from the United States Geological Survey, the accessions of the year are not of great value, some of them contain very interesting material; such, for instance, as a small lot of molluscan fossils from the Aucella-bearing beds of Alaska, collected and forwarded by Mr. William J. Fisher, of Kadiak, Alaska, and a small collection of Alaskan fossils from the Lower Cretaceous of Texas, transmitted by Mr. J. A. Singley, of Austin, Tex. Accessions have also been received from Mr. W. A. George, Forney, Tex.; Mr. Homer Hamline, San Diego, Cal.; Mr. Charles H. Mead, Cream Ridge, N. J., and Dr. E. A. Mearns, U. S. A., of the International Boundary Commission. Two boxes of Cretaceous fossils from California were transferred from the Geological Survey by Mr. H. W. Turner.

The primary arrangement carried out in the installation of the exhibition series is stratigraphic. The biological idea is also preserved, although subordinated to the other. The study series of American fossils is for the most part similarly arranged. The foreign material has not yet been classified.

Dr. White has continued his studies of the Bear River formation in connection with the important collection of fossils from that locality now in the possession of the Museum. The results will probably be published by the Geological Survey.

The explorations of the Survey furnish valuable accessions of fossils, and material of this character is constantly being transferred to the Museum after it has been worked up.

Prof. Alpheus Hyatt, of the Boston Society of Natural History, and Prof. W. B. Clark, of Johns Hopkins University, have had access to the collections for study. Material has also been transmitted to them for investigation.

Two papers based upon material in these collections have been published during the year—one by Mr. T. W. Stanton, the other by Mr. Stanton in connection with Mr. J. S. Diller, of the United States Geological Survey.

The entries in the catalogue of this department amount to 49, and are embraced between the numbers 22960 and 23008, inclusive.

FOSSIL PLANTS.

This collection has remained under the charge of Prof. Lester F. Ward, of the United States Geological Survey, who, in his annual report, states that all of the named material, except such as is needed for study, has been catalogued and included in the card index, which is now complete for the entire collection.

The scientific value of the accessions of the year is fully up to the average, although the number of specimens contributed, which is estimated at 1,000, is less than in 1893.

Among the more important accessions of the year the following may be mentioned: Additional installments of the Lacoë collection, included in seventy-five boxes. This material was prepared by Mr. David White, under the same arrangement with the United States Geological Survey as the previous parts of the collection. The New South Wales Commission to the World's Columbian Exposition presented about thirty species of plants, representing all geological horizons. A large collection of Potomac cycads was lent by the Woman's College of Baltimore for study. An accession of unusual interest to this department consisted of seven large cycads, together with a number of small trunks, from the Lower Cretaceous. This collection, which was obtained by purchase, contains some of the largest trunks yet discovered.

On account of the limited space which it has been possible to assign to the exhibition series, only a very small portion of the collection of this department can be exhibited.

The larger part of the Lacoë collection is still unpacked, awaiting the construction of cases. The study collection of Mesozoic and later material is in good condition and is accessible.

Professor Ward has continued his studies of the Potomac flora, which have so far resulted in more than doubling the number of species known when Fontaine's monograph was published in 1889. He also worked up a collection of plants from the Black Hills of Dakota. He is at present engaged upon a monograph of the North American

cycadian trunks, including the fine examples from South Dakota purchased by the Museum, and the collection of Potomac examples which were lent to the Museum by the Woman's College of Baltimore. The histological portion of this monograph will be prepared by Mr. Knowlton, who has been engaged in continuing his revision of the flora of the Laramie and allied formations. Mr. Knowlton has prepared special reports upon a number of small collections of leaves and wood or lignite from various parts of the country.

Although there have been no explorations which have directly resulted in increasing this collection, many valuable additions have been made by Professor Ward to the collections of Potomac plants, by Mr. Knowlton to the collection of Laramie plants, and by Mr. David White to the collection of Carboniferous material.

From other members of the staff of the United States Geological Survey has been received a considerable amount of material from the western states, including California, Colorado, and Texas.

This department has enjoyed the cooperation of a number of specialists and institutions, and in many cases special courtesies and privileges have been bestowed. Among these are the Museum of Comparative Zoology, Cambridge, Mass.; Princeton College; Columbia College, New York; Woman's College of Baltimore; George H. Ragsdale, Gainesville, Tex.; Prof. William M. Fontaine, University of Virginia, and Mr. Arthur Bibbins, of the Woman's College of Baltimore.

Several papers based on material in this department have been published both by Professor Ward and by Mr. Knowlton. These are referred to in the Bibliography.

There are now in the collection 13,685 specimens in addition to the Lcoe collection, which, it is believed, will amount to over 100,000 specimens.

The entries in the catalogue have been 125 (3642 to 3766 inclusive).

BOTANY.

The number of accessions to the herbarium during the year has been 693, an increase of 126 over the record for the preceding year.¹ The honorary curator, Mr. Frederick V. Coville,² states that the material received has been of special value from a scientific standpoint, since the specimens in many cases were obtained from the most interesting and least-known parts of the country. From the International Boundary Commission a large amount of material has been received. This was collected by Dr. Edgar A. Mearns, U. S. A., assisted by other members of the Commission, particularly Mr. L. Schoenefeldt. Specimens have been forwarded from time to time throughout the year and additional material is expected. The whole collection received from this source,

¹The number of accessions for the past five years has been as follows: 1889-'90, 370; 1890-'91, 621; 1891-'92, 511; 1892-'93, 567; 1893-'94, 693.

²Botanist of the Department of Agriculture.

when worked up, will give very valuable information on the botany of the Mexican boundary region. A large amount of material obtained by the field agents of the Department of Agriculture in Nebraska, Kansas, Idaho, Utah, Washington, and Alaska has also been received. Small collections from various points on the Pacific Coast and adjacent islands have been sent in by the United States Fish Commission. The material obtained by exchange from foreign herbaria has been of unusual value and interest. Among the collections so received mention should be made of 858 specimens from the Royal Botanic Garden, Calcutta, through Lieut. Col. G. King, and the Royal Botanic Garden, Sibpur, India, through Mr. David Prain; a collection of 205 French plants from Prof. S. E. Lassimonne, Yseure (Allier), France, and a collection of 150 Costa Rican plants from Mr. H. Pittier, Instituto Físico-Geográfico, San José, Costa Rica.

The seed collection, which has heretofore been in charge of Prof. Lester F. Ward, has recently been transferred to this department and is now administered in connection with a similar collection belonging to the National Herbarium. This action was authorized by the Acting Secretary of the Smithsonian Institution in a letter dated April 28, 1894. In accordance with the terms of the transfer the collection will be recorded as a deposit from the Smithsonian Institution, and is subject to recall, should this at any time prove to be in the interest of science. The collection is now being studied by the members of the herbarium staff in connection with an investigation regarding the purity and germinating capacity of commercial seed, a matter of great economic as well as scientific importance.

For the purpose of preserving the herbarium specimens from the ravages of insects, the practice of subjecting the plants to the fumes of carbon bisulphide has been followed. The curator states that this method of killing the insects has thus far proved entirely satisfactory. The plants are simply placed in a tight box containing about one ounce of carbon bisulphide in an open vessel, where they are allowed to remain for a number of hours.

The collection has not yet been divided into exhibition and study series, although a small amount of material suitable for exhibition is gradually accumulating, and at some future time may advantageously be arranged for exhibition. The greater portion of the study series is at present housed in the main building of the Department of Agriculture, and is in good condition. The building is not fireproof, however, and, as the valuable collection is in constant danger from fire, it is probable that steps may be taken to arrange for its transfer to a place of greater safety. Mr. Coville, in his report, makes the following recommendation with this object in view:

It is recommended that the National Herbarium be housed in a suitable fireproof building, and that provision be made for materially increasing the library, since the deficiency in the latter respect during the past few years has been most keenly felt. The value of the collections is estimated to be not less than \$150,000.

Dr. J. N. Rose has continued his work upon Mexican plants, including those collected by Mr. Edward Palmer and Mr. E. W. Nelson.

A large amount of material has been lent during the year to investigators outside of Washington, and special researches have been prosecuted by students at the herbarium. These matters will be treated more in detail in another part of this report. In addition to the correspondents there referred to, who have made critical determinations of plants for the Museum, mention should be made of the following persons who have rendered assistance in this manner: Mr. J. G. Baker, Royal Botanical Gardens, Kew, England, determinations of miscellaneous plants; Mrs. Elizabeth Britton, Columbia College, New York, critical determinations of mosses; Mr. C. De Candolle, Geneva, Switzerland, determinations of a number of Mexican plants; Dr. A. Engler, Berlin, Germany, comparison of specimens with Humboldt's types; Mr. E. L. Greene, Berkeley, Cal., determinations of many plants from the western part of the United States. Mr. H. Botting Hemsley has compared certain specimens with types at the Royal Botanical Gardens, Kew, England, and has contributed a number of Mexican plants; Dr. O. Hoffmann, Berlin, Germany, has critically determined a number of Compositæ; Prof. L. Radlkofer, Munich, Bavaria, has determined many plants, especially Sapindaceæ; Mr. L. M. Underwood, Greencastle, Ind., has made critical determinations of specimens of Hepaticæ, and Mrs. H. L. T. Walcott, Dedham, Mass., has contributed many herbarium specimens grown from Mexican seed.

In common with the anthropologist, the botanist also is desirous of ascertaining what plants were used by the aborigines of North America for economic purposes. Mr. Coville has referred to this matter in his annual report, and the following paragraph is quoted from it:

There is urgent need of a collection illustrating the aboriginal economic plant products of the United States from a botanical standpoint, with particular reference to their use for food and in aboriginal arts. It will probably not be possible to actually arrange this collection during the coming year, but the material slowly accumulating will be carefully preserved in such condition as to be available whenever a suitable opportunity for exhibition is presented.

The number of specimens received during the present year is estimated at 85,000.

It is the intention of the curator to ascertain definitely the number of botanical specimens in the possession of the Government during the next fiscal year. Until such a census has been completed, an estimate of the number of specimens in the collection must be based upon the figures given in previous reports. Such an estimate would place the total at over 250,000 specimens. The last entry in the catalogue June 30, 1893, was 2068, while the last entry in June, 1894, was 2761.

A list of the papers published during the year by the honorary curator, and by other officers connected with the National Herbarium, will be found in the Bibliography.

DEPARTMENT OF MINERALS.

The accessions of the year are reported by Prof. F. W. Clarke, honorary curator, as far in advance of those received during 1893, both in number and scientific value. His annual report states that there were received "193 accessions for the year ending June 30, 1894, as against 140 for the previous year, an increase of 53." The larger part of the material received this year has been of exceptional value and has greatly improved both the exhibition and study series.

It should be stated that of the 193 accessions, 114, comprising 5,900 specimens, were incorporated with the collection, while the remaining 79 consisted of material transmitted for examination and report.

The largest number of accessions from one source was received from the United States Geological Survey, comprising three collections of miscellaneous material, a suite of garnets, etc., collected by Mr. Whitman Cross; a suite of calcites collected by Prof. G. K. Gilbert; a collection of minerals obtained by Prof. W. P. Jenney; a collection of minerals from various localities, from the Leidy collection, embracing twelve accession numbers; a suite of minerals collected by Mr. W. H. Melville; a collection of minerals gathered by Messrs. Smith and Cross, and a miscellaneous collection of minerals transmitted by Mr. H. W. Turner.

As a result of the bequest of Mrs. Frances Lea Chamberlain, a collection of cut and uncut gems, semi-precious and ornamental stones, and gem minerals was received from Dr. L. T. Chamberlain, whose very generous attitude toward the Museum is alluded to in greater detail elsewhere in this report.

Important contributions were also received from Mr. C. S. Bement, Philadelphia, Pa.; Mr. Samuel Brady, Detroit, Mich.; Dr. David T. Day, United States Geological Survey; Mr. Henry G. Hanks, San Francisco, Cal.; Mr. Joseph Willcox, Philadelphia, Pa.; the Copper Queen Mining Company, New York City, and the New South Wales Commission to the World's Columbian Exposition.

In accordance with the plan of the curator, the entire collection has been rearranged and remounted. The study series has been classified by species, which have been arranged by locality and association. In this work Mr. Wirt Tassin, assistant curator, has rendered efficient assistance.

Regarding the present condition of the exhibition and study series the curator makes the following statement:

The exhibition series has been greatly improved, notably by two large accessions, i. e., the Leidy collection from the United States Geological Survey, and the Isaac Lea collection of gems and gem minerals, through Dr. L. T. Chamberlain, from the bequest of Mrs. Frances Lea Chamberlain.

The gem collection and the Lea collection of micas and chlorites have been rearranged and supplied throughout with printed labels.

The study series has been arranged so as to accord with the exhibition series in position. Each drawer carries, wherever practicable, a species by itself, and all the species have been arranged, first, by localities, and second, by association. A study

series of "original and type material" has also been made. This series comprises all of the original or type material in the collection, shown by the material itself, or where the specimen was desirable for exhibition, by card giving its location in the case. Each specimen or suite of specimens is accompanied by the pamphlet in which it was described, or by a full and complete reference to the bibliography.

It is the intention of the curator to prepare for publication a handbook to the collection. Each genus in the exhibition series will be supplied with a label giving a brief résumé of the group to which it belongs. A rearrangement of the meteorite collection and the preparation of a catalogue are also among the plans which the curator has in view.

The establishment of a special exhibit of specimens illustrating the physical and chemical properties of minerals is also contemplated.

A census of the collection results in the following tabular statement:

Number of specimens on exhibition:

Systematic series.....	4,563	
Wall and special cases.....	430	
Case of gem minerals.....	238	
The Isaac Lea collection of gems and ornamental stones.....	4,707	
The Isaac Lea collection of micas and chlorites.....	339	
The meteorite collection.....	433	
		10,710
Study series.....	392	
Elements.....	951	
Sulphides.....	345	
Fluorides, haloids, oxides.....	2,489	
Silicates.....	4,782	
Oxygen salts, etc.....	953	
Sulphates.....	517	
Carbonates.....	1,776	
Isaac Lea quartz collection.....	2,246	
"Original and type specimens".....	270	
		14,721
Total in collection.....		25,431

The above statement does not include the duplicates in storage, it having been found impracticable to even estimate their number.

The last entry in June, 1893, was 80990, and in June, 1894, 83320.

DEPARTMENT OF GEOLOGY.

The collections of this department are being rearranged under the direction of the curator, Mr. George P. Merrill. The details are referred to more specifically in the chapter entitled "Development and arrangement of the exhibition series."

When the work of arrangement shall have been completed, the general condition of the collections will be very much more satisfactory than heretofore. As in many other departments of the Museum, more exhibition space is needed, and the necessarily crowded condition of the hall is now the only serious embarrassment.

Regarding the accessions of the year, which were 270 in number, it appears from the report of the curator that, while for exhibition purposes the accessions of the previous year were more important, viewed from a purely scientific standpoint the accessions of the present year are of superior value. Included in this number are 142 "lots" of specimens which were transmitted for examination and report, and most of these were of little, if any, value to the collections.

The more important of the accessions are indicated in the following statement from the curator's report:

In order of their importance the following 22, out of the total 128 regular accessions received, deserve special notice:

From the Imperial Japanese Commission to World's Columbian Exposition, 566 specimens of minerals, rocks, soils, ores, photographs, and geological maps. Exchange.

A systematic historical series comprising some 2,000 specimens obtained from the United States Geological Survey at the close of the World's Columbian Exposition. A series of 10 large transparencies of geological views. Purchased for the World's Columbian Exposition.

Two large slabs of onyx from the Peninsula of Baja, California. Gift.

Five geological models. Received from the United States Geological Survey.

A type series of 122 specimens of Belgian coals. Commercial Museum of Brussels, through Mr. Alfred Le Ghait, minister for Belgium. Exchange.

Eleven fine large selenite crystals from Wayne County, Utah. From J. E. Talmage. Exchange.

One hundred and seven specimens of rocks and ores from Australia. Exchange.

A type series of Italian building and ornamental stones. Received from Chevalier G. Jervis. Purchase.

A fine series of specimens of Sicilian sulphur and amber. From F. W. Crosby. Purchase.

Twenty-five specimens of ores and minerals from Ontario. Received from Dr. David Boyle. Exchange.

Thirty-six specimens of rocks and ores from New South Wales. Received from J. E. Carne. Exchange.

Fourteen specimens of minerals, ores, and geological specimens from Wyoming. Received from H. E. Crain. Gift.

A sample of the diamond-bearing peridotite from the Kimberley mines, and specimens of copper ore, asbestos, and crocidolite. From South Africa. Gift.

Thirty-one specimens of fossil resin, tin, gold, and other ores from Johore. From Rounsevelle Wildman.

Two large masses of serpentine with veins of asbestos. Gift of Johnson Asbestos Mining Company.

Four pieces of wind-polished quartzite from Sioux Valley, Minn. Gift of Sioux Valley Stone Company.

Three fine large spherulites. Silver Cliff District, Colorado. Gift of C. W. Cross.

Block of yellow onyx from near Lehi, Utah. Gift of F. T. Millis.

Large mass of cave gypsum from Upper Styria. Through Dr. A. Brezina. Exchange.

One large block of jasper from near Boise, Idaho. Gift.

In addition mention should be made of two large collections, consisting of rocks and general geological sections, turned in by the United States Geological Survey, but as yet unpacked.

The labeling of the collections has been pushed rapidly forward, and 1,284 forms of labels have been prepared and printed during the year.

The curator has completed a special investigation into the character, origin, and uses of the onyx marbles, and a paper embodying the results was published in the Report of the Museum for 1893. Studies of peculiar types of eruptive rocks from Montana, begun some years ago, have been completed, and the results submitted for publication. The curator has commenced investigations concerning the decay of crystalline rocks, and is also preparing a handbook relating to the non-metallic minerals in the economic series.

Reports have been made upon 142 accessions transmitted for examination. Ten collections, comprising 622 specimens, were sent out in exchange.

Mr. C. W. Cross, of the United States Geological Survey, has had the use of material from the Elk and Henry mountains, Colorado, but the results of his studies have not yet been published.

Eleven papers based upon the geological material in the Museum were published during the year, nine of which were written by the curator.

Owing to the fact that there is now no additional space available for extending the exhibition series, the efforts of the curator will be devoted at present to building up the various collections already under way, with a special view to the display of large and striking objects, which will the more readily invite the attention of visitors.

The number of specimens now contained in the collections, both of systematic and economic geology, is estimated at 63,606, distributed as follows:

Systematic geology:		
Exhibition series.....	8,893	
Study series.....	21,000	
Microscopic slides.....	4,000	
		33,893
Economic geology:		
Exhibition series.....	13,342	
Study series.....	4,371	
		17,713
		51,606
Duplicates in both series.....		12,000
Total.....		63,606

The exhibition series in economic geology has been somewhat reduced, about 1,300 specimens of building stones and ores having been withdrawn and placed in storage.

DEPARTMENT OF ARTS AND INDUSTRIES.

The nucleus of this department consisted of the collections presented to the United States by foreign governments at the close of the Centennial Exposition in 1876. Many of these collections could not properly be incorporated with the material in the custody of any other department in the Museum, and hence arose the necessity for its establishment.

Under the head of "Art and industry" are included the products of the arts and industries of civilized as well as of semicivilized and barbarous races. The material in this department has been assigned to one or another of the several sections, which at the present time are designated as follows:

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Graphic arts. 2. Oriental antiquities. 3. Religious ceremonials. 4. Fisheries. 5. Foods. 6. Physical apparatus. 7. Naval architecture. 8. Musical instruments. | <ol style="list-style-type: none"> 9. Textiles. 10. Porcelains and bronzes. 11. Materia medica. 12. Forestry. 13. Transportation and engineering. 14. Historical collections, coins, and medals. |
|--|--|

These collections are, for the most part, arranged in accordance with a morphological, rather than a geographical plan of classification, objects of a similar nature being placed side by side and arranged, as far as possible, in such a manner as to show progressive development.

It is difficult to decide accurately in all cases whether certain classes of objects should be assigned to this department or to the department of ethnology, with which it is very closely associated. In general, it may be said that when the ethnic idea predominates, the objects are assigned to the latter department.

The graphic arts collection.—This collection has been enlarged and its value enhanced by the incorporation of the exhibit returned from the World's Columbian Exposition.

The principal accession of the year was a gift from the German printing office, received through Prof. W. A. Roese, chief of the chalcographical division. This consisted of reproductions, many of them in color, of rare old etchings, engravings, and woodcuts, as well as of sketches by Dürer, Rembrandt, and other celebrated painters.

Mr. Koehler, in his report on the condition of the collection, says:

Necessarily, as the collections have been formed gradually and almost wholly through solicitation of gifts, and the specimens thus received placed in position as they came in, the quality of many of the specimens, as well as their arrangement, is open to criticism. By rearrangement and a judicious expenditure of money great improvement might be secured. But even as the collection stands to-day it is the best of its kind anywhere in existence and has received warm commendation from high authority.

That part of the collection which is intended to illustrate the technique and history of drawing and painting exists at present in the germ only, and the same may be said of the division devoted to the industrial applications of printing. To develop these divisions appropriately is altogether beyond the reach of the Museum in its present crippled condition.

The contributions to the collection during the year were thirteen in number and references to them are made in the Accession List. These, together with one print obtained in exchange from the Boston Museum of Fine Arts, comprised two hundred and seventy objects, an increase

of sixteen over the previous year, when a number of old prints were purchased for the exhibit prepared in connection with the World's Columbian Exposition.

The paper on Japanese woodcutting and woodcut printing, which was received last year from Mr. Tokuno, the chief of the Japanese Government printing office, has been edited by Mr. Koehler and published in the Museum Report for 1892. This is the first treatise on this most interesting subject, based on authentic information received from a competent native Japanese source, and it has all the value of a treatise based on original research. It contains an account of the technical methods used by Japanese woodcutters and woodcut printers. The notes by the curator are introduced for the purpose of comparing and contrasting these methods with those adopted in Europe and America.

Regarding the curator's plans for the future, he writes:

I am at present engaged in making a card catalogue of the material under my care. This will allow of a systematic arrangement, and will therefore present a better view of all the specimens on hand, including both those on exhibition and in the storage cases.

With the aid of this card catalogue I propose to make a selection of the best specimens available, and then to rearrange the whole exhibition series, if the necessary facilities for this somewhat laborious undertaking can be obtained.

After the best results to be had out of the specimens on hand have thus been secured, it will be desirable to publish a manual of the collection.

Whether anything more shall be done must depend upon the general condition of affairs. Without money and without additional space the development of the section of graphic arts will necessarily have to be suspended for the time being, as soon as the aim above pointed out has been reached.

The last catalogue entry in June, 1893, was 5230, and in June, 1894, 5500.

The collection of oriental antiquities.—In 1888 the establishment of this collection, which is in reality an outgrowth of the department of ethnology, was decided upon, under the honorary curatorship of Dr. Paul Haupt, of the Johns Hopkins University, with Dr. Cyrus Adler as assistant curator.

Exhibition space has been provided for the collection on the south side of the east hall. A series of casts of Assyrian and Babylonian seals is being gradually developed, and the collection already contains several very interesting specimens. Collections of oriental seals have been transmitted by Mr. Edgar Miller, of Baltimore, and Dr. Frederick Stearns, of Detroit, Mich., for study and copying.

A notable collection of Egyptian mummy cases and small figures, the gift of the Egyptian Government, has been installed along with other Egyptian objects on the north side of the east hall.

Dr. Adler has prepared a translation and description of two objects from Persepolis, received through the courtesy of Hon. Truxton Beale, formerly United States minister to Persia. A paper relating to these casts was published in the Museum Report for 1893.

Physical apparatus.—During the past year, as heretofore, the honorary curator of this section, Mr. W. C. Winlock, has been so fully occupied with his administrative duties in the Smithsonian Institution that it has been possible for him to devote but very little time to the collection of physical apparatus.

Among the accessions during the year, mention may be made of a series of seismographic instruments and photographs of instruments from the Imperial Japanese Commission to the World's Columbian Exposition; an electric motor made by the late Professor Henry, and a battery used in connection with the first electro-magnetic telegraph, deposited by Miss M. A. Henry; a set of scales purchased from the Ceylon Commission to the World's Columbian Exposition; a collection of photographs relating to physical and astronomical subjects from Miss Carrie Henry, and globes from Baron A. E. Nordenskiöld, Stockholm, Sweden, through the Royal Swedish Commission to the World's Columbian Exposition.

During the year about seventy-five specimens have been added to the collection

The materia medica collection.—Since the preparation of the last report, the care of this collection has passed into the custody of Medical Inspector Daniel McMurtrie, U. S. N. The collection is very nearly complete, so that no efforts will be made at present to acquire new material, excepting such as may be necessary for the renewal of specimens no longer suitable for exhibition. During the year it was found desirable to remove the collection to the north-east court, where it is now installed and in excellent condition for examination and study.

The condition of the collection, as at present classified, is shown in the following table:

Exhibition series	3,368	
Reserve series	1,226	
Duplicate series	860	
		5,454
Illustrations:		
Colored plates	663	
Photographs	102	
		765
Herbarium specimens	60	
Micrographs	38	
		98
Total		6,317

Transportation and engineering.—Owing to the absence of the curator, Mr. J. E. Watkins, very little has been accomplished during the year covered by this report. The number of accessions is less than for the year preceding, although they are of great historical value.

The South Carolina Railroad has presented a number of sections of track-rail, plates, spikes, and other articles used during the years 1830 and 1831; also photographs from the exhibit made by this road at the World's Columbian Exposition. Mr. E. A. Stevens, of Hoboken,

N. J., deposited, for exhibition in the Museum, the engine built by John Stevens, in 1804, for the first steam screw-propeller boat ever constructed. The engine is mounted in a model of the original boat.

A model of a bridge over the Tjitjatt River, Java, was obtained by purchase from the World's Columbian Exposition. A model of a suspension bridge and another of a bamboo bridge were also purchased, the former from the Mexican Commission and the latter from the Ceylon Commission to the World's Columbian Exposition.

There have been 15 entries made in the catalogue during the year, representing 19 specimens.

The historical collections.—The already overcrowded condition of the exhibition hall has rendered it impossible to place any additional historical collections on exhibition, and the entire series of medals, coins, and portraits have remained in storage during the year.

There have been 39 accessions to the collections during the year, aggregating 608 specimens. Although considerably less in number than those of last year, they have more permanent historical interest. The principal objects were: An office suit of black cloth and a cravat belonging to Abraham Lincoln and worn by him in the last days of his life, presented to the Smithsonian Institution by Mrs. William Hunt; portraits of Abraham Lincoln and Charles Sumner, painted by W. Hunt and deposited by Mrs. William Hunt; a large collection of wearing apparel dating from 1700 to 1750, and of household utensils, deposited by Mr. J. B. Copp, Old Mystic, Conn.; a sword carried by Nathan Allen during the Revolutionary war, deposited by Mrs. Hannibal Allen Hopkins, of Michigan; a large series of medals commemorative of the World's Columbian Exposition and of the Columbian celebrations in Spain and Italy; an interesting typical series of sixty-two original ancient Greek, Roman, and Bactrian gold, silver and copper coins, deposited by Dr. Thomas Wilson; a bronze medal commemorative of the Washington Memorial Arch erected in New York City, the gift of the Washington Memorial Arch Committee, H. G. Marquand, chairman, and R. W. Gilder, secretary; a full-size plaster cast of the Leif Ericson statue erected in Boston, Mass., presented by Miss Anne Whitney; a portrait in oil of Alfred Vail, who participated in the invention and introduction of the electric telegraph, bequeathed to the Smithsonian Institution by the late Amanda O. Vail, widow of Alfred Vail; six specimens of early Mexican copper coins, presented by the Mexican Commission to the World's Columbian Exposition; the original model of the electric motor made by Prof. Joseph Henry in 1834, and the decoration of the order of St. Olaf conferred on Professor Henry, deposited by Miss Henry; a collection of early charts, books, etc., connected with arctic explorations and lent by Baron Nordenskiöld; a collection of American Indian medals transmitted by the Bureau of Ethnology.

The growing popular interest in American history during the colonial and revolutionary war periods suggests that it may be advisable

for the Museum to make special effort to secure and preserve objects pertaining to the men and events of those periods.

The number of specimens included under the head of "historical collections" now aggregates nearly 30,000, of which only about 4,500 are on exhibition.

DEPARTMENT OF ETHNOLOGY.

The collections in this department received several important accessions from the World's Columbian Exposition, the larger number of them being purchased. Among these are objects from the exhibits of Japan, Johore and the Straits Settlements, Ceylon, and Korea. An interesting collection, gathered by Hon. W. W. Rockhill in Tibet, was purchased, and an extensive collection of objects from Finland was obtained through the assistance of Hon. J. M. Crawford, United States consul-general at St. Petersburg.

The principal contributions to the department consisted of a collection from the Seychelles and Comoro islands, presented by Dr. W. L. Abbott; series of pictures and ethnological objects from the Malayo-Polynesian area, contributed by Dr. Otto Finsch; photographs illustrating Mexican social life, from Rev. E. X. T. Cleveland, and a small collection of ethnological objects from Alaska, presented by Mr. Thomas Lee. From the United States Fish Commission was received a collection of ethnological objects, chiefly connected with the fisheries of Alaska.

Additional exhibition space has been assigned to this department. In the north-west court will be set up an exhibit showing the whole life of the Pueblo region. Regarding this exhibit, Prof. Otis T. Mason, curator, makes the following statement:

It will be recalled that in the south-west corner of the United States there are five distinct linguistic stocks of Indians, all living in pueblos. There are now twenty-one of these pueblos inhabited, but hundreds have gone to ruin. Besides the cliff dwellings, cave dwellings, and cavate dwellings in the canyons round about can not be separated from the pueblos. Indeed, the curator discovered in the great cliff-dweller collections at Chicago examples of pueblo life and others, unmistakably belonging to the ancient city of Mexico, which Mr. Lewis H. Morgan has defined to be only an enormous pueblo.

In the west hall the ethnology of the eastern hemisphere will be shown, as in the past, a portion of the eastern end of the hall being set apart for the exhibit illustrative of the great religions of the world. The east hall, devoted hitherto to the elaboration of different arts among uncivilized peoples, will continue to be used for this purpose, the western portion being set apart, however, for the display of ecclesiastical archæology. In the east-north range and north-east range are exhibited collections illustrating navigation and the fisheries. These collections, although coming strictly under the general scope of ethnology, are for the present administered as sections of the department of art and industries.

In the arrangement of the study series the whole human race is treated by the curator as one species, and objects relating to each thought, or art, or series of phenomena, are placed together for the purpose of comparative study.

During the year the curator completed his work on "Woman's Share in Primitive Culture" and also a work on "The Origin of Inventions." He has also published a monograph on "The Bows, Arrows, and Quivers of the American Aborigines," as well as a paper on "Migration and the Food Quest."

The curator has afforded special facilities to Mr. Joseph D. McGuire, of Ellicott City, Md., in his studies of the aboriginal methods of working stone by all the described processes. A paper by Mr. McGuire, entitled "A Study of the Primitive Methods of Drilling," is published in this volume.

Reference to the work of other investigators who have had access to the collections of this department will be found on page 39.

In several sections of the Museum, specimens belonging to this department and typifying the lowest forms of human activity in certain respects, have been utilized as the starting point of elaborative or evolutionary series.

Regarding the plans which the curator has in mind for the future development of this department, he says:

With reference to the development of the department of ethnology, it is my highest wish to place the subject upon a truly scientific basis, and to have material collected, observed, photographed, and arranged with such pains and accuracy as would be devoted to specimens in other departments of natural history. The great questions in ethnology arise partly through the incompleteness of the specimens and of the data; as soon as the material is rightly collected, and the information scrupulously obtained, a truth reveals itself at once; to this end, I should like to see a closer cooperation among the ethnological museums of the world. -

Much of our work is in the dark, because a portion of the specimens necessary to the single study are in one museum and the remaining portion hid away in another. Those who have these in charge are neither of them aware of the riches possessed by the other; for instance, the question is raised whether a certain people invented a certain art out and out, or borrowed it from another people. If the two arts were properly examined, and the elements of the problem properly obtained, it would not take a tyro more than a few minutes to decide this question; but because of the superficiality of information, and the incompleteness and haphazard gathering of material, this question is constantly arising and occasions no small controversy.

In the exhibition series it should be aimed to have the lay figures absolutely expressive of the bodily features and general appearance of the people. In setting up their objects the parts should be so shown as to exhibit their anatomy and the progress of the industry. In short, it is the curator's desire in the future to put on exhibition a great variety of unique collections which, with the proper number of carefully assorted objects, will tell to the ordinary visitor, at a single glance, the whole story.

The number of specimens added to the collection during the year is 5,088. The last catalogue entry in June, 1893, was 167435, and in June, 1894, 168856.

American aboriginal pottery.—Toward the close of the fiscal year Mr. W. H. Holmes, the honorary curator, left Washington to accept a position in the Field Columbian Museum, Chicago.

Among the accessions of the year the following may be mentioned: From Mr. C. H. B. Floyd, Savannah, Ga., a collection of Indian pottery; from Mr. H. A. Blain, Springville, Ark., two collections of pottery; from Mr. P. L. Jouy, specimens of pottery made in San Antonio (Cuernavaca), State of Morelos, Mexico; from Mr. Elias J. Payn, of Tres Piedras, N. Mex., pottery from San Juan, Mexico, and from Dr. Edgar A. Mearns, of the International Boundary Commission, pottery and fragments of pottery collected near the boundary between the United States and Mexico.

Preparations have been made for the transfer of the aboriginal pottery to the department of prehistoric anthropology. The pottery from the Pueblo region will be reserved for exhibition in the north-west court with other material from the same locality, the whole Pueblo collection to be administered by the curator of ethnology.

There were 49 entries made in the catalogue during the year, representing 99 specimens.

DEPARTMENT OF PREHISTORIC ANTHROPOLOGY.

The rearrangement of the collections of this department, which are exhibited in the upper hall of the Smithsonian building, including the removal of the Pueblo models and their associated objects to a separate hall, has occupied the time of the curator, Dr. Thomas Wilson, and his assistants during the greater part of the year. The aboriginal pottery, which had been exhibited in the hall with the Pueblo pottery, in the Museum building, has been removed to the archæological hall.

Extensive collections of material gathered by officers of the Bureau of Ethnology have been transferred to the Museum.

Among the most valuable accessions from other sources are several which have been acquired by exchange. Of these the most important were received from Mr. Edward Lovett, of Croydon, England; Mr. T. H. Powell, of London, England; Mr. E. J. Taylor, Washington, D. C. Large collections of archæological implements were lent to the Museum by Mr. Byron E. Dodge, Richfield, Mich., and Dr. Thomas Wilson, curator of the department.

The curator has prepared several papers relating to the material under his care or to the general subject of archæology; among them, one on the testing of the antiquity of bones of fossil animals by the use of fluorine, and another on the origin and use of the sign known as Swastika, which forms one of the special papers in this volume. He has also commenced a paper on prehistoric trepanation, and another describing the Museum collection of Egyptian, Trojan, and Etruscan antiquities. Dr. Wilson has published several papers in the reports of the Eighth and Ninth International Congress of Americanists, as

well as others in the reports of the Smithsonian Institution and the National Museum for 1892.

Considerable time has been devoted to the identification of specimens forwarded for examination and report, and Dr. Wilson states that about one thousand three hundred specimens have been examined and classified during the year. Most of them were returned to the senders.

This class of material has usually but little scientific value, although the finders or owners of objects associated with antiquity are generally inclined to believe them to be possessed of special significance. While, therefore, as in the department of geology, a great deal of work is added to the duties of the curator by reason of these requests for identification, the Museum gains very little, and this is the more true, as senders of specimens that have any value usually require them to be returned. It is possible that, should this class of inquirers increase in the next few years as it has in the past, it may become necessary to stipulate that the Museum be allowed to retain any material of this character which may be found desirable for permanent addition to the collections.

Among the matters which the curator has in mind for the further development of the department are (1) the completion of the rearrangement of the collections on a geographical basis; (2) the display of the collection of aboriginal pottery, which has been removed from the northwest court in the Museum building; (3) the arrangement, cataloguing, and labeling of the Etruscan collections; (4) the completion of the work of labeling the general collections on exhibition; and (5) the preparation of a large map showing the position of mounds in the United States.

The total number of entries made on the catalogue during the year was 19,674. In this number is included a considerable amount of material received previous to July, 1893, but not entered on account of other pressing duties, as well as the accessions of the year covered by this report and numbering 13,242 specimens. The total number of specimens now in the department is 153,424.

The distribution of sets of casts of stone implements to colleges and other educational institutions has been continued, fourteen having been sent out during the year. These were presented to Pomona College, Claremont, Cal.; Fort Worth University, Fort Worth, Tex.; Franklin College, Franklin, Ind.; Ashland College Museum, Ashland, Ohio; Institution for the Education of the Deaf, Indianapolis, Ind.; Western Reserve Historical Society, Cleveland, Ohio; Agricultural College and School of Science, Pullman, Wash.; The Trocadéro Museum, Paris, France; Guilford College, Guilford College, N. C.; Manchester Museum, Owens College, Manchester, England; Field Columbian Museum, Chicago, Ill.; Peking University, Peking, China, and Wesleyan University, Middletown, Conn. In addition, special collections, several of them in exchange for other material, have been sent to the Trocadéro

Museum, Paris; Field Columbian Museum, Chicago; the Canadian Institute, Toronto, Canada; the Jefferson County Library, Fairfield, Iowa; the Western Reserve Historical Society, Cleveland, Ohio; the Department of Historical Collections, Des Moines, Iowa; and to the following individuals: Mr. H. W. Williamson, New Galilee, Pa.; Mr. E. J. Taylor, Washington, D. C.; Mr. L. L. Frost, Susanville, Cal.; M. Gabriel de Mortillet, St. Germain-en-Laye, Paris, France, and Mme. Matheron Seville, Grand Pressigny, France. The specimens contained in these special sendings amounted to 1,274 in number.

IV.—ADMINISTRATION.

REVIEW OF THE WORK OF THE ADMINISTRATIVE BUREAUS.

OFFICE OF THE CHIEF CLERK.

This office remains in charge of Mr. W. V. Cox. In Appendix II a detailed statement is presented showing the disposition of the unexpended balance on hand June 30, 1893, the amount of the appropriations for the year ending June 30, 1894, and the disbursements on account of the same.

During the present fiscal year a change has been made in the manner of awarding contracts. By act of Congress approved January 27, 1894, the Secretary of the Treasury is required to designate the day for opening all bids for furnishing supplies for the Executive Departments and for other offices. The bids are opened at the specified time by a committee appointed for that purpose, and are then scheduled and transmitted to the Secretary of the Treasury for his action.

The accounts and other matters pertaining to the World's Columbian Exposition have been finally settled and disposed of, so far as the work of this office is concerned.

With a view to raising the standard of efficiency of the watch force of the Museum, a new set of rules has been prepared. These rules were formulated after examining the regulations adopted by the other Departments in this city, and also those governing the Metropolitan police force. A copy of these regulations is printed in Appendix III.

The necessity for extending the telephone service in the Museum has for some time been apparent, and during the year steps have been taken in this direction. A number of new instruments have recently been placed upon the market, and the Museum has accepted an offer made by a telephone company to install several of its instruments on trial, free of charge, with the understanding that they may be purchased outright if satisfactory. As the price of these instruments is less than the amount paid for one year's rental of the telephones now in use, the cost of the service will be considerably reduced in the event that they are accepted.

CORRESPONDENCE AND REPORTS.

This division of the administrative work remains under the charge of Mr. R. I. Geare. The clerical staff in his office consists of three stenographers, one accession clerk, two index and reference clerks,

one file clerk, two typewriters, and a messenger, all of whom have performed their duties faithfully and efficiently.

The opening and distribution of the mail, the preparation and mailing of replies, excepting those letters which are reserved by the Assistant Secretary for personal attention, the preparation of reports to senders of material for examination, and of acknowledgments of gifts, loans, and exchanges, the preparation of the annual bibliography of the Museum and list of accessions, the general preparation and editing of the Annual Report, as well as the care and distribution of all the publications of the Museum, form the principal features of the work of this office.

During this year 9,854 official papers of all kinds were prepared for the signature of the Secretary or Assistant Secretary. The correspondence of the Museum extends to almost every country in the world, and includes persons living in almost every town and village in the United States. Hardly a day passes in which twenty to thirty letters asking for specific information on some scientific subject are not received, and probably an equal number have reference to obtaining publications on some special topic. All letters are answered as promptly as the desired information can be obtained, and the increase in the correspondence is doubtless largely due to this fact.

The accessions of specimens average 1,000 to 1,200 each year, and in every instance the form of acknowledgment best suited to the case is carefully considered and prepared.

Distribution of Museum publications.—It is within the limit to state that during each year more than 30,000 publications, including volumes and separates, are distributed from this office. The routine work is necessarily very complicated, owing to the large variety of subjects treated and the various scientific branches in which the recipients are interested.

At the time when the present system of distribution was adopted many of the features were necessarily experimental and tentative, and have since been subjected to modification. It has been found possible to dispense with the list corresponding to the general catalogue of recipients, which had served its purpose, as well as a number of duplicate lists of individuals and establishments receiving publications relating to special branches of science, which lists had served for reference while the original lists were in actual use by the document clerk in making distributions.

The names of recipients who are entered upon special lists, such as those of Government officials and consular officers, are now included in the general catalogue. It is now possible by reference to a single catalogue to determine the status of every individual receiving any class of Museum publications.

A catalogue record, giving a concise statement of the regular distribution of each publication issued by the Museum during the year,

has been carefully preserved, and has been of much service. It has also been found advisable to note, in catalogue form, the date of publication of each paper and volume.

Much time and attention has been devoted to the revision of the mailing lists, which by reason of deaths, changes of residence, etc., are subject to constant change.

At the present time about one-half of the lists of recipients of publications relating to special subjects have been printed in the form of labels, and when distribution is to be made it is necessary only to detach them and paste them upon the packages intended for transmission. An attempt was made during the current year to print the remainder of these lists and also the additions which have been made from time to time to those already printed. This project was abandoned, however, owing to the expense involved in the composition of the labels at the Government Printing Office.

It is thought that the method of distribution has been improved by making provision in this office for the reception of a limited number of copies of each of the publications of which copies are still in stock, and, except in cases where sendings comprise both Smithsonian and Museum publications, shipment is now made direct from this office.

Until recently, both the Smithsonian Institution and the National Museum distributed the publications of the Museum from a common stock, keeping independent records of transmission. This caused confusion, and led to needless liability to error, which, however, can be readily avoided, now that the distribution of the Museum publications rests entirely with the Museum.

The Museum Report for 1891, Volumes XV and XVI of the Proceedings, and Bulletins 43, 44, 45, and 46 have been distributed during the year. There have also been distributed, in the form of separates, copies of the papers published in the appendices to the Reports for 1891 and 1892, Proceedings papers Nos. 916, 917, 918, 921, 927, 930-980, and advance sheets of Nos. 986, 999, and 1006.

REGISTRATION AND DISTRIBUTION.

The registrar, Mr. S. C. Brown, states that during the year 49,138 packages of all kinds were received at the Museum, including publications, material returned from the World's Columbian Exposition—consisting of 1,229 boxes and packages, or 32 car loads—and 494 packages containing specimens obtained at the Exposition for the Museum. The remainder consisted of supplies of various kinds and of specimens received from different sources for addition to the collections. The number of entries made on the record of incoming packages was 2,696. There were 3,414 packages sent out during the year, covering 1,105 entries on the outgoing transportation record.

The number of accessions or lots of specimens received during the year for addition to the collections was 1,161. There were also 478

"temporary" accessions, consisting of material received for examination and report. The records show that 27,168 specimens were sent out as gifts and exchanges. In addition, 1,448 specimens were lent for study.

By direction of the Assistant Secretary, Mr. S. C. Brown went to Chicago at the close of the World's Columbian Exposition to assist in the formal transfer of material presented to the Museum by foreign governments and private exhibitors.

Collections transmitted to educational establishments.—The work of distributing collections to educational establishments has been continued during the year, and numerous sets of rocks and ores, minerals, marine invertebrates, and casts of prehistoric implements have been sent out. The preparation of a new series of marine invertebrates (No. V) has enabled the Museum to comply with a large proportion of the pending applications for that class of material. Although, as stated in the last report, it was expected that collections of bird skins and fishes would be available for distribution during the present fiscal year, this hope has not been realized, owing to the fact that the time of the curators has been fully occupied with other pressing matters.

The number of applications for specimens received from universities and colleges and from the lower schools is gradually increasing, and as there are many thousands of duplicates in the various departments of the Museum which could readily be spared for this purpose, it is a matter of regret that lack of funds should so seriously interfere with the work of separating them into sets for distribution. It is especially unfortunate that so many applications from the lower schools must, under existing conditions, be refused, for it has been found necessary, as a rule, to limit the distribution of the collections so far prepared to universities and colleges, upon the ground that the material could be used by them to the best advantage. It is fully realized, however, that there is a large number of high schools throughout the country which could make good use of such collections in connection with their scientific work. As an evidence of this fact, it may be stated that of the total number of applications received within the past few months probably one-half have been from schools of this grade. The work which could be done by the Museum in this direction, with adequate appropriations, can hardly be said to be of any less importance than that which may be accomplished by the distribution of its publications. The latter are useful mainly to advanced students and investigators, while, as already intimated, interest in the elementary study of the natural sciences may be stimulated by placing within the reach of the students in the lower schools such material as will be of use to them in connection with their work in these branches.

During the year one hundred and eight collections have been distributed to educational establishments.

General distributions.—In Appendix IV will be found a detailed statement, arranged geographically, showing to what institutions and individuals specimens were sent during the year, either in exchange, as gifts, or for study. The following brief summary, arranged geographically, shows the number of lots of specimens sent out:

United States:		United States—Continued.	
Arkansas.....	2	Pennsylvania.....	15
California.....	8	South Carolina.....	2
Connecticut.....	1	South Dakota.....	2
District of Columbia.....	18	Tennessee.....	1
Florida.....	2	Texas.....	3
Georgia.....	3	Utah.....	1
Illinois.....	8	Virginia.....	3
Indiana.....	6	Washington.....	2
Iowa.....	14	West Virginia.....	1
Kansas.....	6	Wisconsin.....	3
Louisiana.....	3	Foreign countries:	
Maryland.....	6	Australia.....	2
Massachusetts.....	14	Canada.....	3
Maine.....	2	China.....	1
Michigan.....	1	England.....	8
Minnesota.....	4	France.....	5
Missouri.....	4	Germany.....	5
Nebraska.....	1	Hawaii.....	1
New Hampshire.....	3	Mexico.....	1
New Jersey.....	1	Russia.....	3
New Mexico.....	1	Tasmania.....	1
New York.....	18	Total.....	201
North Carolina.....	1		
Ohio.....	11		

The number of specimens sent out from the various departments of the Museum as gifts and exchanges during the year ending June 30, 1894, is shown by the following table:

Department.	Specimens.
Ethnology.....	47
American aboriginal pottery.....	56
Oriental antiquities.....	2
Prehistoric anthropology.....	2,869
Mammals.....	1
Birds.....	161
Reptiles and batrachians.....	4
Fishes.....	802
Invertebrate fossils.....	161
Mollusks.....	321
Insects.....	264
Marine invertebrates.....	18,611
Recent plants.....	224
Minerals.....	1,332
Geology.....	2,313
Total.....	27,168

BUILDINGS AND LABOR; POLICE AND PUBLIC COMFORT.

In the report of the superintendent of buildings, Mr. Henry Horan, is included a list of the cases and furniture made, altered, and repaired in the Museum shops during the year; a table showing the number of mechanics and laborers employed each month; a list of the tools in use by the department; a list of articles lost and found; a table giving the average temperature in the Museum building for each month of the year; the number of telephone calls received; the number of requisitions filled, and the amount of fuel and ice used. In addition, Mr. Horan gives a general review of the work accomplished by the members of the force under his charge, an abstract of which will be found in Appendix V.

WORK OF THE MUSEUM PREPARATORS.

TAXIDERMISTS.

Mr. William Palmer, chief taxidermist, has submitted, in his annual report, a detailed statement of the work accomplished during the year by the force under his charge. Many of the skins received from Mr. H. C. Moore were made up dry, while specimens of *Dicotyles tajacu*, *Mephitis mephitis*, *Alcelaphus lunatus*, *Oriba eweand*, and *Cunochætes taurina* have been mounted, together with a few others received from various sources. A large number of the skins which have been in pickle for some time past received attention, although much still remains to be done in this direction, which, owing to the pressure of other work, has necessarily been neglected. Two additional lead-lined tanks were made for the better accommodation of a portion of those skins which have hitherto been stored in barrels. After the close of the World's Columbian Exposition, the work of packing the collections sent to Chicago by the department of mammals and the department of birds was undertaken by Mr. Palmer's force. This material, upon its arrival at Washington, was unpacked and placed upon exhibition in the halls of the Museum.

As usual, a great deal of incidental work was done, such as the making of casts and molds of shells, geological and anthropological specimens, seals, etc.

A total of 166 skins were received during the year, as indicated in the following table:

Primates	13	Rodentia	37
Carnivora	83	Marsupialia	8
Ungulata	21		
Chiroptera	1	Total	166
Edentata	3		

There were 59 mammals received in the flesh, about three-fifths having come from the National Zoological Park. From the date of the establishment of the park it has been the custom to turn over to

the Museum all animals which have died from the effects of confinement or other causes, and the additions to the Museum collection from this source have been of considerable importance. In this connection attention is called to the following table:

Mammals received in the flesh.

Mammals.	From the National Zoological Park.	From other sources.
Primates	11	1
Carnivora	7	3
Ungulata	8	3
Edentata	1	.....
Chiroptera.....	.....	2
Rodentia	8	13
Insectivora.....	.....	1
Marsupialia	1	.....
Total	36	23

Of the whole number of dry skins prepared, about one-half came in during the year, the balance being on hand from the receipts of previous years. The totals are given below:

Primates.....	12	Chiroptera.....	5
Carnivora.....	53	Edentata.....	1
Ungulata.....	77	Marsupialia.....	2
Rodentia.....	32		.....
Insectivora.....	2	Total.....	184

In addition, 22 dry skins belonging to the deposit of the Department of Agriculture were prepared.

At the close of the fiscal year there was a total of 484 skins on hand.

OSTEOLOGICAL PREPARATOR.

The work of the osteologist, Mr. J. W. Scollick, has consisted largely in the preparation of specimens for the study series, although a number of mounted pieces have been added to those already on exhibition. The following table shows the number of specimens received, cleaned, and mounted:

	Mammals.	Birds.	Reptiles.	Batrachians.	Fishes.	Total.
Received as fresh specimens:						
Entire skeletons.....	6	20	4	.....	.....	30
Incomplete skeletons.....	2	.....	.....	.....	.....	2
Cleaned:						
Entire skeletons.....	7	16	3	.....	.....	26
Parts of skeletons.....	4	28	.....	.....	.....	32
Skulls.....	881	12	.....	.....	1	894
Mounted:						
Entire skeletons.....	1	9	1	.....	2	13
Parts of skeletons.....	.....	25	.....	.....	.....	25
Skulls.....	.....	25	.....	1	2	28
Total.....	901	144	8	1	5	1,059

In addition to the above, 20 anatomical models were mounted and a number of specimens have been repaired. Considerable time has also been spent in mounting and repairing specimens of vertebrate fossils.

Better facilities are needed for handling large specimens, and especially for macerating and cleaning them.

PHOTOGRAPHER.

The photographer, Mr. T. W. Smillie, reports that 772 negatives have been made during the year for the various departments in the Museum, including ethnology, mammals, geology, prehistoric anthropology, marine invertebrates, and fossil plants. In addition, 2,112 prints, 229 cyanotypes, and 45 lantern slides were made.

COLORIST.

Mr. A. Zeno Shindler was engaged during the early part of the year in completing his work on material designed for use in connection with the exhibit of the Museum at the World's Columbian Exposition. Later he was occupied in restoring some of the pictures in the Catlin Indian gallery and upon miscellaneous items of work in the department of ethnology. A large map of the United States, showing the location of burial mounds, etc., was painted for the department of prehistoric anthropology.

APPENDIX I.

THE SCIENTIFIC AND ADMINISTRATIVE STAFF.

(Corrected to Oct. 1, 1895.)

KEEPER, EX OFFICIO,

S. P. Langley, Secretary of the Smithsonian Institution.

EXECUTIVE OFFICERS.

G. Brown Goode, Assistant Secretary of the Smithsonian Institution, in charge of the U. S. National Museum.

Frederick W. True, Executive Curator.

W. V. Cox, Chief Clerk.

R. E. Earll, Editor of Proceedings and Special Agent for Cotton States and International Exposition.

SCIENTIFIC STAFF.

ARTS AND INDUSTRIES: G. Brown Goode, Curator.

Graphic Arts: S. R. Koehler, Curator.

Religious Ceremonial Objects: Cyrus Adler,¹ Custodian.

Materia Medica: J. M. Flint,¹ United States Navy, Curator.

Historical Collections: A. Howard Clark,¹ Custodian.

Technological Collections: J. E. Watkins, Curator.

Forestry: B. E. Fernow,¹ Curator.

Physical Apparatus: W. C. Winlock,¹ Curator.

ETHNOLOGY: O. T. Mason, Curator; Walter Hough, Assistant Curator.

Aboriginal Pottery: William H. Holmes,¹ Curator.

Pueblo Collections: F. H. Cushing, Custodian.

ORIENTAL ANTIQUITIES: Paul Haupt,¹ Curator; Cyrus Adler,¹ Assistant Curator.

PREHISTORIC ANTHROPOLOGY: Thomas Wilson, Curator.

MAMMALS: Frederick W. True, Curator; R. S. Matthews, Aid.

BIRDS: Robert Ridgway, Curator; C. W. Richmond, Assistant Curator.

BIRDS-EGGS: Charles Bendire,¹ Major U. S. A. (retired), Curator.

REPTILES AND BATRACHIANS: Leonhard Stejneger, Curator.

FISHES: Tarleton H. Bean,¹ Curator; Barton A. Bean, Assistant Curator.

MOLLUSKS: William H. Dall,¹ Curator; C. T. Simpson, Aid; W. B. Marshall, Aid.

INSECTS: L. O. Howard,¹ Curator; W. H. Ashmead,¹ Custodian of the Collection of Hymenoptera; D. W. Coquillett,¹ Custodian of the Collection of Diptera; M. L. Linell, Aid.

MARINE INVERTEBRATES: Richard Rathbun,¹ Curator; J. E. Benedict and Miss M. J. Rathbun, Assistant Curators.

Helminthological Collections: C. W. Stiles,¹ Custodian.

COMPARATIVE ANATOMY: Frederic A. Lucas, Curator; Frank Baker,¹ Associate Curator.

PLANTS (NATIONAL HERBARIUM): F. V. Coville,¹ Curator; J. N. Rose,¹ Assistant Curator.

¹ Honorary, and serving without salary.

PALEONTOLOGY: C. D. Walcott,¹ Curator; Charles Schuchert, Assistant Curator.

Vertebrate Fossils: O. C. Marsh,¹ Curator; F. A. Lucas, Assistant Curator.

Invertebrate Fossils:

Paleozoic: Charles Schuchert.

Mesozoic: T. W. Stanton,¹ Custodian.

Cenozoic: W. H. Dall,¹ Associate Curator.

Fossil Plants: Lester F. Ward,¹ Associate Curator; F. H. Knowlton,¹ Custodian of Mesozoic Plants; D. White, Custodian of Paleozoic Plants.

MINERALS: F. W. Clarke,¹ Curator; Wirt Tassin, Assistant Curator.

GEOLOGY: George P. Merrill, Curator; W. H. Newhall, Aid.

LIBRARY: Cyrus Adler,¹ Librarian; Newton P. Scudder, Assistant Librarian.

ASSOCIATES.

Theodore N. Gill,¹ Associate in Zoology.

R. E. C. Stearns,¹ Associate in Zoology.

R. W. Shufeldt,¹ Associate in Comparative Anatomy.

C. A. White,¹ Associate in Paleontology.

ADMINISTRATIVE STAFF.

CHIEF CLERK: W. V. Cox.

CHIEFS OF DIVISION:

Correspondence and Reports: R. I. Geare.

Registration and Storage: S. C. Brown.

Disbursing Clerk: W. W. Karr.

Property Clerk: J. S. Goldsmith.

Photographer: T. W. Smillie.

Superintendent of Buildings: Henry Horan.

PREPARATORS.

Joseph Palmer, Chief Modeler.

William Palmer, Chief Taxidermist.

A. Z. Shindler, Colorist.

J. W. Scollick, Osteologist.

Henry Marshall, Taxidermist.

N. R. Wood, Taxidermist.

A. H. Forney, Taxidermist.

¹ Honorary, and serving without salary.

APPENDIX II.

FINANCE, PROPERTY, SUPPLIES, AND ACCOUNTS.

The appropriations for the fiscal year ending June 30, 1894, were as follows:

For continuing the preservation, exhibition, and increase of the collections from the surveying and exploring expeditions of the Government, and from other sources, including salaries or compensation of all necessary employees, \$132,500.

For cases, furniture, and fixtures, and appliances required for the exhibition and safe-keeping of the collections of the National Museum, including salaries or compensation of all necessary employees, \$10,000.

For expenses of heating, lighting, electrical, telegraphic, and telephonic service for the National Museum, \$11,000.

For postage stamps and foreign postal cards for the National Museum, \$500.

For printing labels and blanks and for the Bulletins and annual volumes of the Proceedings of the National Museum, \$12,000.

For rent of work shops for the National Museum and for expenses of transfer from the so-called Armory building, \$1,000. (Urgent deficiency act, approved March 12, 1894.)

PRESERVATION OF COLLECTIONS.

From the unexpended balance of the appropriation for the fiscal year ending June 30, 1893, the following disbursements have been made, in liquidation of liabilities contracted during that year: For salaries or compensation, \$57.50; for special or contract service, \$568.95; for supplies, \$1,312.65; for stationery, \$994.04; for freight and cartage, \$465.98; for travel, \$299.59; for specimens, \$2,509.54; for books and periodicals, \$888.26, making a total of \$7,096.51, and leaving a balance of \$318.02.

From the appropriation of \$132,500 for the fiscal year ending June 30, 1894, disbursements have been made as follows: For salaries or compensation, \$119,995.05; for supplies, \$1,395.78; for stationery, \$363.27; for freight and cartage, \$2,419.55; for travel, \$449.88; for specimens, \$3,054.55; for books and periodicals, \$641.72, making a total of \$128,319.80, and leaving an unexpended balance June 30, 1894, of \$4,180.20.

FURNITURE AND FIXTURES.

From the unexpended balance of the appropriation for the fiscal year ending June 30, 1893, disbursements have been made as follows: For special or contract service, \$1.25; for exhibition cases, \$448; for storage, \$774; for designs and drawings for cases, \$11.25; for drawers, trays, and boxes, \$10; for frames, stands, and miscellaneous woodwork, \$45.70; for hardware and interior fittings for cases, \$291.35; for tools, \$189.32:

for cloth, cotton, etc., \$66.24; for glass jars, bottles, etc., \$2.74; for lumber, \$197.65; for paints, oils, glue, and brushes, \$80.40; for office and hall furniture, etc., \$249.50; for metals, \$46.99; for leather and rubber goods, \$432.79; for apparatus, \$89.75; making a total of \$2,939.93, and leaving an unexpended balance, June 30, 1894, of \$0.16.

From the appropriation of \$10,000 for the fiscal year ending June 30, 1894, the following disbursements have been made: For salaries or compensation, \$5,525.75; for special or contract services, \$29.25; for designs and drawings for cases, \$9.25; for drawers, trays, and boxes, \$321.50; for frames, stands, and miscellaneous woodwork, \$58.98; for glass, \$103.82; for hardware and interior fittings for cases, \$495.19; for tools, \$32.13; for cloth, cotton, etc., \$54.27; for glass jars, bottles, etc., \$501.81; for lumber, \$826.91; for paints, oils, glue, and brushes, \$554.83; for office and hall furniture, etc., \$209.95; for metals, \$64.68; for tiles, \$201.50; for leather and rubber goods, \$17.28; for iron brackets, \$143.42; for apparatus, \$46.24; making a total of \$9,196.76, and leaving a balance, June 30, 1894, of \$803.24.

The following is a list of cases, furniture, etc., purchased during the year: One oak roll-top desk, \$39; one oak washstand, \$12; one Standard sewing machine, \$35; one typewriter cabinet, \$30; one cherry file case, \$50; one cherry insect cabinet, \$80; two hundred white pine unit drawers, \$155; one poplar stepladder, \$1.90; one antique oak revolving bookcase, \$40; six standard pine card-catalogue cases, \$186; two mahogany standard table cases, \$84; six standard pine bookcases, \$120.

The following is a partial list of cases, furniture, and fittings constructed in the Museum shops during the year: One single and two double wall cases for publications, one half-unit cherry moth-proof case, one small oak case, one small pine file case, four pine cases for electrotype and woodcuts, seven pine storage cases, one mahogany key case, forty-six pine bases, fifteen walnut bases, two oak bases, one hundred and forty-two pine blocks, one oak block, thirty-nine double-unit moth-proof drawers, fifty-two double-unit drawers, one unit drawer, six half-unit drawers, fifty-two mahogany label frames, one mahogany picture frame, one oak picture frame, one tin frame for electric motor, twelve mahogany frames for slope-top cases, one pine frame for holding maps, one pine window frame, one pine frame for archway in rotunda, one large pine frame for mounting map, one large pine frame for mounting deer antlers, one large pine frame for mounting picture of cave-dwellers, one large mahogany frame for holding unit boxes, one pine skeleton frame for holding unit boxes, five pine frames for photographs, eight pine storage racks, one oak table.

The following is a partial list of cases, furniture, and fittings repaired and altered: One cabinet with drawers, one pine storage case, backs of two mahogany unit table cases, five mahogany flat-top cases, two knock-down cases, one small ebonized case top, one oak wall case, two pine catalogue cases, one pigeonhole case, twelve slope wall cases, four pine

wall cases, one mahogany file case, one quarter-unit case, nine pine storage cases, two pine floor cases, three pine sorting cases, two mahogany pier cases, one pine bookcase, two mahogany cases, one mahogany upright floor case, one mahogany Kensington case, two mahogany slope-top cases, one large oak floor case, five sorting case drawers, thirty drawers for quarter-unit cases, three drawers for unit cases, fifteen drawers for storage cases, three hundred and three unit drawers, ten mahogany wing frames, two ash picture frames, two wall screens, one floor screen, six pine tables.

In addition to this work, a large number of cases have been glazed, painted, and varnished, and many doors, screens, shelves, boxes, tanks, and other articles have been made or altered.

HEATING, LIGHTING, AND ELECTRICAL SERVICE.

From the unexpended balance of the appropriation for the fiscal year ending June 30, 1893, disbursements have been made as follows: For gas, \$111.50; for telephones, \$150; for electrical work, \$30; for electrical supplies, \$324.25; for rental of call boxes, \$20; for heating supplies, \$69.43; for repairs to heating apparatus, \$123.75; making a total of \$828.93, and leaving an unexpended balance, June 30, 1894, of \$11.10.

From the appropriation of \$11,000 for the fiscal year ending June 30, 1894, disbursements have been made as follows: For salaries or compensation, \$5,034.75; for special or contract services, \$61.50; for coal and wood, \$2,671.80; for gas, \$1,367.76; for telephones, \$522.12; for electrical supplies, \$112.56; for rental of call boxes, \$100; for heating supplies, \$393.21; for repairs to heating apparatus, \$12; making a total of \$10,275.70, and leaving an unexpended balance, June 30, 1894, of \$724.30.

POSTAGE STAMPS.

The entire amount of the appropriation, \$500, was expended.

PRINTING.

From the appropriation of \$12,000 for the fiscal year ending June 30, 1894, the following disbursements have been made: For the Bulletin, \$5,033.06; for the Proceedings, \$4,080.85; for extras of ethnological papers from the Annual Report, \$1,149.31; for printing labels, \$949.02; for printing letter-heads, pads, and envelopes, \$193.87; for printing blanks, \$306.43; for binding books, \$175.64; for the Congressional Record, \$68; making a total of \$11,956.18, and leaving an unexpended balance, June 30, 1894, of \$43.82.

RENT OF WORKSHOPS.

From the appropriation of \$1,000 for rent of workshops and expenses of transfer (Urgent Deficiency act, approved March 12, 1894), disbursements have been made as follows: For rent, \$188.71; for services, \$354; making a total of \$542.71, and leaving an unexpended balance, June 30, 1894, of \$457.29.

APPENDIX III.

RULES GOVERNING THE WATCH FORCE OF THE U. S. NATIONAL MUSEUM.

The watch force of the National Museum shall consist of not less than twenty-four persons duly appointed by the Secretary of the Smithsonian Institution, or by his order.

The applicants must possess the qualifications, except as to residence required for appointment on the police force of the District of Columbia, which are summarized as follows: (1) Be able to read and write the English language; (2) be a citizen of the United States; (3) never have been indicted and convicted of crime; (4) be at least 5 feet 8 inches in height; (5) be between 22 and 35 years of age; (6) of physical health and vigor; (7) of good moral character; (8) of unquestionable energy and courteous manners.

The applicant shall be subject to such medical and other examinations as may be deemed necessary for the full understanding of his fitness.

The watchmen will be under the control of the chief of the watch, acting under instructions of the superintendent, or in his absence, the assistant superintendent.

The watch will be organized in three reliefs, of one chief and seven men each, each relief to remain on duty eight hours and be under the immediate control of the chief.

In case of sickness, the chief, or the superintendent, should be notified at least one hour in advance of the time for posting the relief to which such watchman belongs.

Watchmen when on duty will wear badge, dark-blue clothes, and cap.

The chief of each watch shall be held responsible for the safe-keeping of all property under his care, and his orders must be strictly obeyed. The chief of watch shall require all keys to the buildings before going on duty, and when relieved will turn the same over to his successor. He will make the rounds of the entire watch at least every two hours, and be responsible for the enforcement of the rules.

The night watchmen when going upon duty shall (1) see that all doors and windows are securely fastened; (2) satisfy themselves that there are no strangers in the buildings; (3) see that the water pipes and fires are in a safe condition and that the fire plugs and fire extinguishers are in readiness for immediate use. They are strictly prohibited from smoking while patrolling the buildings, and must exercise proper care to prevent accidents from their lanterns. They shall visit each record station every hour and make proper record with the clock; any failure to do this must be strictly accounted for.

All signals and telephone calls are to be answered without delay, and emergencies are to be announced by code signals. All telephone-room business must be regarded as confidential and not be made the subject of conversation. Information as to messages is not to be repeated to anyone, except in case communication can not be had with the official for whom the message was intended. The sender of the message should then be informed and his wishes learned relative to repeating it to any other than the person for whom intended.

Watchmen stationed at public entrances must be in their places at the signal for opening, and shall not be absent during the hours of exhibition, unless properly relieved. Those stationed at the doors by which the workmen and attendants enter shall accurately record the time of arrival for duty of such employees.

Watchmen on duty when the ice is delivered to the buildings shall weigh and examine the same, and determine its fitness for use.

Watchmen shall refuse admission to disorderly persons. Canes, umbrellas, parasols, baskets, and bundles shall be retained at the door, and checks given for the same. No packages, except such as have been checked by the doorkeeper, shall be taken from the building without properly signed permits, which must be filed. No fees shall be received, under penalty of discharge. Dogs shall be excluded by watchmen.

Watchmen shall record daily the readings of the automatic enumerator.

Watchmen stationed at the entrance to offices shall answer questions and prevent intrusions. Watchmen will collect permits granting the privilege of sketching or photographing objects in the buildings.

All watchmen shall remain on duty until regularly relieved.

When relieved the chief of watch will strictly observe the instructions in regard to the transfer of keys of the buildings, and shall report to his successor any irregularities or suspicious circumstances that may have been observed. He shall notify the superintendent immediately in case of fire or serious accident, and report promptly any damage done to property by accident, or otherwise, during his time of duty. After the buildings are closed in the afternoon, and until the hour of reopening, the watchmen are forbidden, under penalty of dismissal, to allow any person to remain, or to enter, whose name is not upon the posted lists, or who is not provided with a properly certified pass. This rule applies also on Sundays and other days when the Museum is closed. No exception can be made in favor of friends of the watchmen.

The pass list is divided as follows:

LIST NO. I.

The following-named persons are permitted to enter the Smithsonian and Museum buildings after they are closed to the public, to introduce friends accompanying them, carry packages out of the building, or sign permits for the removal of packages containing objects belonging to their departments. (See list.)

LIST No. II.

Passes have been issued to the following-named persons, by the Assistant Secretary, executive curator, or chief clerk, United States National Museum.

These passes (Forms A, B, Museum; C, D, Smithsonian) will admit the holder to the buildings between 7.30 a. m. and 8 p. m.

Additional authority must be obtained to remain in the buildings during hours other than those given above. (See list.)

<p>SMITHSONIAN INSTITUTION.</p> <p>No. Form A.</p> <p>PASS</p> <p>.....</p> <p>into the U. S. NATIONAL MUSEUM BUILDING.</p> <p>Pass issued..... expires</p> <p>.....</p> <p>Chief Clerk, U. S. National Museum.</p>	<p>SMITHSONIAN INSTITUTION.</p> <p>No. Form B.</p> <p>PASS</p> <p>.....</p> <p>into the U. S. NATIONAL MUSEUM BUILDING.</p> <p>Pass issued..... expires</p> <p>.....</p> <p>Chief Clerk, U. S. National Museum.</p> <p>This pass entitles bearer to carry out packages containing personal property without additional permit.</p>
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<p>SMITHSONIAN INSTITUTION.</p> <p>No. Form C.</p> <p>PASS</p> <p>.....</p> <p>into the SMITHSONIAN INSTITUTION BUILDING.</p> <p>Pass issued..... expires</p> <p>.....</p> <p>Chief Clerk, U. S. National Museum.</p>	<p>SMITHSONIAN INSTITUTION.</p> <p>No. Form D.</p> <p>PASS</p> <p>.....</p> <p>into the SMITHSONIAN INSTITUTION BUILDING.</p> <p>Pass issued..... expires</p> <p>.....</p> <p>Chief Clerk, U. S. National Museum.</p> <p>This pass entitles bearer to carry out packages containing personal property without additional permit.</p>
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LIST No. III.

The following-named persons are permitted during office hours to carry out packages containing official matter and specimens. (See list.)

LIST No. IV.

The following-named persons are permitted to carry tools from building to building during working hours. (See list.)

Mechanics, except those whose names are upon the mechanics' list, may not carry out tools without passes from the superintendent.

Passes of admission are not valid unless signed by the Secretary, Assistant Secretary, executive curator, assistant in charge of office, Smithsonian Institution, or the chief clerk, United States National Museum.

Passes for more than one week's duration will be posted in the watchman's book.

Passes not posted in the watchman's book are to be taken up by the watchman when presented for admission.

A list of persons on duty in each building, when closed to the public, will be furnished the watchmen by the superintendent or his assistant on the first of every month.

Any watchman admitting persons not provided with passes will be liable to discharge.

Except during the hours of public admission, the main entrance of the Museum building will be kept closed, and access to the building gained only by ringing the bell at the entrance to the northwest pavilion. Every person admitted when the buildings are closed shall register his name upon a special record kept for that purpose, and the watchman on duty is required to note opposite the name the hour of admission and departure. When a person, whose name is on the list, is accompanied by a friend, he must sign his own name underneath that of his friend, preceded by the words, "Introduced by."

No Museum property shall be removed from the buildings, except upon the presentation of a written order signed by the Secretary, Assistant Secretary, executive curator, or chief clerk. The property clerk may transfer property from building to building or to and from storage. The watchman stationed at the entrance of the northwest pavilion will allow those to pass out with books who are entitled to the privileges of the library.

Watchmen are instructed to detain packages from being carried out of the buildings unless the bearer presents a permit signed by some officer whose name is on the permit list (No. I). These permits shall be filed in the office of the superintendent of buildings.

These rules do not apply to boxes or packages leaving the buildings under the direction of the registrar.

The chief of the watch will see that the United States flag is raised upon the flagstaff of the Smithsonian Institution and United States National Museum at sunrise and lowered at sunset.

Any disobedience on the part of watchmen, or failure to report violations of these rules, will be regarded sufficient cause for dismissal.

By order of the Assistant Secretary:

W. V. COX, *Chief Clerk.*

SEPTEMBER 29, 1893.

APPENDIX IV.

STATEMENT OF THE DISTRIBUTION OF SPECIMENS DURING THE YEAR ENDING JUNE 30, 1894.

NORTH AMERICA.

BRITISH AMERICA.

Canada.

- ONTARIO: Canadian Institute, Toronto: Stone implements (181 specimens, sets 7 and 8). Exchange. (D. 8423.)
Lambe, Lawrence M., Geological Survey, Ottawa: Sponges (7 boxes). For study.¹ (D. 8038.)
BRITISH COLUMBIA: Provincial Museum, Victoria: Crabs (3 species). Gift.

MEXICO.

- Dugès, Alfred, Guanajuato: Fish (1 specimen). Exchange. (D. 8130.)

UNITED STATES.

- ARKANSAS: Arkansas Industrial University, Fayetteville: Duplicate fishes (38 species); duplicate marine invertebrates (Series V, set 78). Gift. (D. 8054.) (D. 8173.)
CALIFORNIA: Anthony, A. W., San Diego: Bird skins (8 specimens). Exchange. (D. 8061.)
California Academy of Sciences, San Francisco: Duplicate marine invertebrates (Series V, set 6). Exchange. (D. 8171.)
Frost, L. L., Susanville: Grooved stone ax. Exchange. (D. 7927.)
Leland Stanford Junior University, Stanford University: Duplicate marine invertebrates (Series V, set 1). Exchange. *Uranidea semiscaber* (3 specimens). Lent for study. (D. 8248.) (D. 8141.)
Pomona College, Claremont: Casts of prehistoric stone implements (set 21). Gift. (D. 7892.)
Schlarbaum, Paul, Loveland: Sphinx moths (2 specimens). Exchange. (D. 8439.)

CALIFORNIA—continued.

- University of California, Berkeley: Duplicate marine invertebrates (Series V, set 8). Gift. (D. 8172.)
CONNECTICUT: Wesleyan University, Middletown: Casts of stone implements (set 34); duplicate minerals (set 168); duplicate rocks and ores. Gift. (D. 8430.)
DISTRICT OF COLUMBIA: Adee, A. A., Washington: Specimens of invertebrates. For microscopic examination. (D. 8077.)
Beale, Hon. Truxton, Washington: Casts of bas-relief from Persepolis (2 specimens). Exchange. (D. 8274.)
Bureau of American Ethnology, Washington: Model of brain (by Auzoux, Paris). For examination. (D. 8057.)
Gibbs, E. A., Washington: Foraminifera (9 lots). For microscopic examination. (D. 8091.)
Hawkins, John, Washington: Samples of Foraminifera. For microscopic examination. (D. 7974.)
Hay, W. P., Washington: Duplicate marine invertebrates (28 specimens). Exchange. (D. 8165.)
Hearst Kindergarten, Washington: Shells, invertebrates, and mounted birds (4 boxes). Gift. (D. 8178.)
Howell, E. E., Washington: Duplicate rocks and ores (380 specimens). Exchange. (D. 7958.)
Jennings, Foster, Washington: Moccasins (1 pair). Exchange. (D. 7917.)
Langdale, J. W., Washington: Calcite and calcite geode (2 specimens). Exchange. (D. 8168.)
Merriam, Dr. C. Hart, Washington: Specimens of *Geomys*. Lent for study.¹ (D. 8028.)

¹ Returned.

DISTRICT OF COLUMBIA—continued.

- Museum of Hygiene, Washington: Collection of mollusks. Gift. (D. 8313.)
- Oldroyd, Capt. O. H., Washington: Chair, hat, and stand used by President Lincoln. Loan. (D. 7984.)
- Saunma-Jeltsch, Baron A. von, Washington: Collection of flint flakes, hammer stones, leaf-shaped implements, stone chisels, and pestles (43 specimens). Exchange. (D. 8364.)
- Scidmore, Miss E. A., Washington: Indian basketry (3 specimens). Exchange. (D. 8295.)
- Stiles, Dr. C. W., Washington: Collection of parasitic worms. Lent for study. (D. 7986.)
- Taylor, E. J., Washington: Casts of prehistoric stone implements (set 24); original stone implements (68 specimens). Exchange. (D. 8086.)

FLORIDA: Wayne, Arthur T., Waukeelah: Specimen of bird skin. Lent for study.¹ (D. 8326.)

White, J. J., Rockledge: Shells (30 specimens). Exchange. (D. 8117.)

GEORGIA: Atlanta University, Atlanta: Marine invertebrates (Series V, set 60). Gift. (D. 8288.)

Columbus College, Columbus: Duplicate rocks and ores (set 121). Gift. (D. 8431.)

Yeates, W. S., State geologist, Atlanta: Duplicate minerals (177 specimens). Exchange. (D. 7979.)

ILLINOIS: Avon High School, Avon: Duplicate marine invertebrates (Series V, set 92). Gift. (D. 8193.)

Baur, Dr. G., University of Chicago, Chicago: Turtles (13 specimens) and skulls of turtles (3 specimens). Lent for study. Specimen of *Anniella*. Exchange. (D. 8083). (D. 8218.)

Field Columbian Museum, Chicago: Sandstone slab showing traces of *Climactichnites*; casts of stone implements (set 32); stone implements (set 22); collection of Indian pottery. Gift. Casts of quarry group. (D. 8317). (D. 8435.)

Hazlett, George K., Chicago: Photographs of watches. Exchange. (D. 7900.)

ILLINOIS—continued.

High School, Bushnell: Duplicate marine invertebrates (Series V, set 91). Gift. (D. 8281.)

Northern Illinois College, Fulton: Duplicate minerals (set 160). Gift. (D. 8108.)

INDIANA: Butler University, Irvington: Duplicate marine invertebrates (Series V, set 32). Gift. (D. 8213.)

Eigenmann, Prof. C. H., Bloomington: Specimen of *Ophibolus getulus*. Exchange. (D. 8301.)

Franklin College, Franklin: Duplicate alcoholic fishes (set 30); casts of prehistoric stone implements (set 23). Gift. (D. 7954.)

Institution for the Education of the Deaf, Indianapolis: Casts of prehistoric stone implements (set 26); duplicate marine invertebrates (Series V, set 58). Gift. (D. 8128.) (D. 8255.)

Woolman, Prof. A. J., South Bend: Collection of Mexican fishes. Lent for study.¹ (D. 7873.)

IOWA: Cornell College, Mount Vernon: Duplicate marine invertebrates (Series V, set 75). Gift. (D. 8278.)

High School, Dubuque: Duplicate rocks and ores. Gift. (D. 8346.)

Hubbard Public School, Hubbard: Duplicate rocks and ores. Gift. (D. 8333.)

Iowa Agricultural College, Ames: Duplicate rocks and ores (set 132); duplicate minerals (set 161); duplicate marine invertebrates (Series V, set 20). Gift. (D. 8276.)

Iowa Masonic Library, Cedar Rapids: Stuffed fishes (6 specimens). Gift. (D. 8129.)

Iowa State Normal School, Cedar Falls: Duplicate rocks and ores (set 123). Gift. (D. 8383.)

Jefferson County Library Association, Fairfield: Collection of original stone implements (274 specimens). Gift. (D. 8214.)

Lenox College, Hopkinton: Duplicate rocks and ores (set 126). Gift. (D. 8345.)

Museum of State Library, Des Moines: Original stone implements (99 specimens). Gift. (D. 7951.)

¹ Returned.

IOWA—continued.

National Science Association, Ottumwa:
Duplicate rocks and ores (set 136).
Gift. (D. 8085.)

Nutting, Prof. C. C., Iowa City: Birds'
skins (5 specimens). Lent for study.¹
(D. 8315.)

Tilford Collegiate Academy, Vinton:
Duplicate rocks and ores (set 125).
Gift. (D. 8362.)

KANSAS: Ashland City Schools, Ashland:
Collection of duplicate shells (32 spec-
imens); duplicate marine inverte-
brates (Series V, set 29). Gift. (D.
8133.)

Gould, C. N., Ashland: Duplicate min-
erals (18 specimens). Exchange.
(D. 8052.)

High School, Oskaloosa: Duplicate
minerals (set 158). Gift. (D. 8051.)

Southern Kansas College, Winfield:
Duplicate marine invertebrates (Se-
ries V, set 22). Gift. (D. 8322.)

State Normal School, Emporia: Dupli-
cate marine invertebrates (Series V,
set 93). Gift. (D. 8201.)

LOUISIANA: Kohn, Gustav, New Orleans:
Coach-whip snake. Exchange. (D.
8302.)

Louisiana State University and Agri-
cultural and Mechanical College,
Baton Rouge: Duplicate marine in-
vertebrates (London series). Gift.
(D. 8081.)

Ruston College, Ruston: Duplicate
minerals (set 157). Gift. (D. 8009.)

MAINE: Bayley, W. S., Waterville: Rocks
(4 specimens). Exchange. (D. 8290.)

Morton, F. S., Portland: Foraminifera.
For microscopic examination. (D.
8076.)

MARYLAND: Bagg, Rufus M., jr., Balti-
more: Foraminifera (15 vials). For
microscopic examination. (D. 8210.)

Clark, Prof. William B., Johns Hopkins
University, Baltimore: Cretaceous
echinoids (11 specimens). Lent for
study in connection with the prep-
aration of a work on the mesozoic
echinodermata of the United States.
Foraminifera. For microscopic ex-
amination. (D. 8252.) (D. 7992.)

MARYLAND—continued.

Uhler, Prof. Ph. R., Baltimore: Homop-
tera from British West Indies (2
boxes). Lent for study. (D. 8366.)

Willson, George A., Ashton: Mounted
specimen of owl. Exchange. (D.
8017.)

Woman's College of Baltimore, Balti-
more: Duplicate alcoholic fishes.
Gift. (D. 7994.)

MASSACHUSETTS: Brewster, William,
Cambridge: Birds' skins (121 spec-
imens); specimen of mounted bird.
Lent for study.¹ Birds' eggs (31 spec-
imens, 8 species). Exchange. (D.
8032.) (D. 8034.) (D. 8053.)

Frazer, George B., West Medford: Du-
plicate minerals (100 specimens).
Exchange. (D. 8024.)

Hyatt, Prof. A., Cambridge: Spec-
imens of shells of *Pinna*. Lent for
study. Specimens of fossils. Lent for
study in connection with an investi-
gation of the inheritance of acquired
characters.¹ (D. 7983.) (D. 8410.)

Morse, Prof. Albert P., Wellesley: Col-
lection of insects. Lent for study
in connection with a revision of the
genus *Spharagemon*.¹ (D. 8387.)

Museum of Comparative Anatomy,
Cambridge: Birds' skins (18 spec-
imens); sandstone slab showing traces
of *Climactichnites*. Gift. (D. 8394.)
(D. 8417.)

Museum of Fine Arts, Boston: Siamese
silver vessels (3 specimens). Ex-
change. (D. 8344.)

Peabody Academy of Sciences, Salem:
Small collection of objects connected
with aboriginal corn culture. Gift.
(D. 8062.)

Scudder, Prof. S. H., Cambridge:
Orthoptera (12 species). Exchange.
(D. 8449.)

Westfield Normal School, Westfield:
Duplicate rocks and ores (set 138).
Gift. (D. 7915.)

MICHIGAN: University of Michigan, Ann
Arbor: Indian pottery (56 spec-
imens). Gift. (D. 7969.)

MINNESOTA: Central High School, Du-
luth: Duplicate marine inverte-
brates. Gift. (D. 8174.)

MINNESOTA—continued.

- St. John's University, Collegeville: Duplicate rocks and ores (set 131). Gift. (D. 8232.)
- State Normal School, Mankato: Duplicate minerals (set 162). Gift. (D. 8233.)
- Stevens Seminary, Glencoe: Duplicate marine invertebrates (Series V, set 90). Gift. (D. 8325.)
- MISSOURI: Central College, Fayette: Duplicate marine invertebrates (Series V, set 26). Gift. (D. 8258.)
- Hurter, Julius, St. Louis: Lizards (2 specimens). Exchange. (D. 8303.)
- Page, William F., Neosho: Samples of shell life (dredgings). Exchange. (D. 8007.)
- William Jewell College, Liberty: Duplicate marine invertebrates (Series V, set 89). Gift. (D. 8354.)

NEBRASKA: Knox County Historical and Scientific Society, Niobrara: Duplicate minerals. Gift. (D. 8424.)

NEW HAMPSHIRE: Miller, Gerrit S., jr., Peterboro: Skin and skull of meadow mouse. Exchange. (D. 7898.)

York, William F., Nashua: Specimens of wulfenite, geyserite, and silicified wood. Exchange. (D. 8220.)

NEW JERSEY: Princeton College, Princeton: Sandstone slab showing traces of *Climactichnites*. Gift. (D. 8418.)

NEW MEXICO: University of New Mexico, Albuquerque: Duplicate rocks and ores. Gift. (D. 8401.)

NEW YORK: Allen, Dr. J. A., American Museum of Natural History, New York: Skin and skull of *Scalops aquaticus*; specimen of *Arvicola edax*; skins and skulls of *Sigmodon*; alcoholic bats (2 specimens). Lent for study.¹ (D. 7881.) (D. 7948.) (D. 8179.) (D. 8413.)

Brooklyn Institute, Brooklyn: Duplicate marine invertebrates (Series V, set 3). Gift. (D. 8175.)

Biological Laboratory, Brooklyn Institute of Arts and Sciences, Cold Spring Harbor, Long Island: Duplicate marine invertebrates (Series V, set 9); special set of alcoholic fishes (113 species). Gift. (D. 8369.)

NEW YORK—continued.

Chapman, Frank M., American Museum of Natural History, New York: Birds' skins (22 specimens). Lent for study.² (D. 8374.)

College of the City of New York, New York: Specimens of *Pentacrinus*, *Pentacta*, and *Nereis*, also specimens of mollusks. Gift. (D. 9260.)

Cornell University, Ithaca: Collection of Tertiary fossils; Cretaceous fossils (58 specimens). Gift. (D. 8280.) (D. 8304.)

Demcker, Robert, New York: Minerals (34 specimens). Exchange. (D. 7980.)

Glen Island Museum, Glen Island: Birds' skins (72 specimens); duplicate marine invertebrates (Series V, set 11). Exchange. (D. 8386.) (D. 8434.)

Hills, G., Hudson: Two mounted specimens of *Tympanuchus americanus*. Exchange. (D. 8231.)

Osborn, Prof. Henry F., American Museum of Natural History, New York: Rough skeleton of sea otter. Lent for study.² (D. 8184.)

St. Gabriel's School, New York: Duplicate minerals. Gift. (D. 8332.)

Wilder, Dr. Burt G., Cornell University, Ithaca: Specimen of *Chimera affinis* and *Hydrolagus colliei*. Exchange. (D. 8342.)

NORTH CAROLINA: Guilford College, Guilford: Casts of stone implements. Gift. (D. 8240.)

OHIO: Adelbert College, Cleveland: Duplicate marine invertebrates (Series V, set 4); foraminifera (12 lots). Gift. (D. 8142.) (D. 8180.)

Ashland College, Ashland: Duplicate rocks and ores (set 135); casts of stone implements (set 25). Gift. (D. 8116.)

Beebe, Dr. H. E., Sidney: Minerals (41 specimens). Exchange. (D. 8004.)

Case School of Applied Science, Cleveland: Duplicate marine invertebrates (Series V, set 5). Gift. (D. 8170.)

Oberlin College, Oberlin: Duplicate rocks and ores. Gift. (D. 8373.)

¹ Specimen of *Arvicola edax* and alcoholic bats returned.

² Returned.

OHIO—continued.

- Ohio Wesleyan University, Delaware: Duplicate marine invertebrates (Series V, set 25). Gift. (D. 8279.)
- Moorehead, Warren K., Columbus: Notched and rude chipped implements (8 specimens). Exchange. (D. 8010.)
- St. Mary's Convent, Dayton—A small number of mineral specimens for class use. Gift. (D. 8119.)
- Western Reserve Historical Society, Cleveland: Casts of prehistoric stone implements (set 27); collection of arrow-heads and large stone implements (338 specimens). Gift. (D. 8157.) (D. 8254.)

- PENNSYLVANIA: Academy of Natural Sciences of Philadelphia, Philadelphia: One specimen of *Chimara affinis*. Gift. (D. 8136.)
- Central State Normal School, Lock Haven: Duplicate marine invertebrates. Gift. (D. 8253.)
- Clark, Hurbert L., Pittsburg: Alcoholic birds (2 lots); alcoholic specimen of barred owl. Lent for study.¹ (D. 8109.) (D. 8359.) (D. 8442.)
- Dickinson College, Carlisle: Duplicate alcoholic fishes (set 31); duplicate marine invertebrates (Series V, set 2). Gift. (D. 8003.) (D. 8147.)
- Dickinson Seminary, Williamsport: Duplicate minerals (set 165). Gift. (D. 8331.)
- Dixon, Dr. Samuel, Philadelphia: Skin of mouse. Lent for study.¹ (D. 7913.)
- Foote, Prof. A. E., Philadelphia: Minerals (55 specimens). Exchange. (D. 8078.)
- Franklin Institute, Philadelphia: Building and ornamental stones (2 boxes). Lent for examination.¹ (D. 8071.)
- Rhoads, S. N., Academy of Natural Sciences of Philadelphia, Philadelphia: Skins and skulls of *Bassariscus astuta*. Lent for study.¹ (D. 8002.)
- Ryder, Prof. John A., Philadelphia: Foraminifera. For examination. (D. 7941.)
- The Museum, Charmian: Duplicate rocks and ores. Gift. (D. 7888.)

PENNSYLVANIA—continued.

- Western University of Pennsylvania, Allegheny: Duplicate marine invertebrates (Series V, set 24). Gift. (D. 8294.)
- Williamson, H. W., New Galilee: Arrow-heads (50 specimens). Exchange. (D. 8221.)
- SOUTH CAROLINA: Claflin University, Orangeburg: Marine invertebrates (Series V, set 59). Gift. (D. 8234.)
- Mayo High School, Darlington: Duplicate rocks and ores (set 134). Gift. (D. 8153.)
- SOUTH DAKOTA: Black Hills College, Hot springs: Duplicate rocks and ores (set 137). Gift. (D. 8001.)
- University of South Dakota, Vermillion: Duplicate alcoholic fishes (set 38). Gift. (D. 8043.)
- TENNESSEE: Pryor Institute, Jasper: Duplicate minerals (set 159). Gift. (D. 8090.)
- TEXAS: Baylor University, Waco: Duplicate marine invertebrates (Series V, set 27); duplicate minerals (set 163). Gift. (D. 8273.)
- Fort Worth University, Fort Worth: Duplicate casts of stone implements (set 22). Gift. (D. 7940.)
- University of Texas, Austin: Duplicate marine invertebrates (Series V, set 23). Gift. (D. 8312.)
- UTAH: Deseret Museum, Salt Lake City: Rocks and ores (92 specimens). Exchange. (D. 7943.)
- VIRGINIA: College of William and Mary, Williamsburg: Duplicate rocks and ores (set 129); duplicate minerals (set 164). Gift. (D. 8321.)
- Daniel, John W., jr., Lynceburg: Birds' eggs (77 specimens). Exchange. (D. 8421.)
- Normal School, Hampton: Duplicate marine invertebrates (3 boxes, special set). Gift. (D. 7871.)
- WASHINGTON: Washington Agricultural College and School of Science, Pullman: Duplicate rocks and ores (set 133); casts of stone implements (set 28); duplicate marine invertebrates (Series V, set 23). Gift. (D. 8189.) (D. 8241.)

WEST VIRGINIA: Mannington Graded School, Mannington: Duplicate minerals (set 155). Gift. (D. 7906.)

WISCONSIN: High School, Black Earth: Duplicate minerals (set 156). Gift. (D. 7957.)

St. Clara's Academy, Sinsinawa: Duplicate rocks and ores (set 130). Gift. (D. 8311.)

University of Wisconsin, Madison: Plaster casts of ripple marks (2 specimens); 1 photograph. Gift. (D. 8406.)

ASIA.

CHINA.

Peking University, Peking: Rocks (set 120); minerals (set 169); casts of stone implements (set 33). Gift. (D. 8436.)

EUROPE.

ENGLAND.

Lankester, Prof. E. Ray, Oxford: Four specimens of *Branchiostoma*. Lent for study.¹ Eight specimens of *Branchiostoma*. Exchange. (D. 8348.)

Moss, William, Ashton-under-Lyne: Collection of shells. Exchange. (D. 8261.)

Newton, Prof. Alfred, Magdalen College, Cambridge: Birds (8 specimens). Exchange. Collection of birds' skins. Lent for study.¹ (D. 8027.) (D. 8355.)

Salvin, Osbert, London: Birds' skins (5 specimens). Lent for study in connection with the preparation of a catalogue of the Procellariidae in the British Museum. (D. 8339.)

University Museum, Oxford: Echinoderms, crustaceans and alcoholic specimen of *Thelyphonus giganteus*. Gift. (D. 7905.)

FRANCE.

Bonnet, A. C., Paris: Collection of Tertiary fossils. Exchange. (D. 8343.)

Lassimonne, Prof. S. E., Yseure, Allier: Herbarium specimens (223). Exchange. (D. 8169.)

Musée Trocadéro, Paris: Prehistoric stone implements (3 boxes); casts of prehistoric stone implements (246 specimens, set 29). Exchange. (D. 8206.)

GERMANY.

Fürbinger, Dr. Max, Jena: Alcoholic birds and frogs. Lent for examination in connection with studies of the muscular and nervous systems. (D. 8425.)

Lemke, Miss Elizabeth, Rambitten bei Saalfeld, East Prussia: Specimen of *Zuñi* spindle and bone needle. Exchange. (D. 8088.)

Miller, Dr. C. O., Heidelberg: Specimens of termites. For microscopic examination. (D. 7928.)

Molnár, Ludwig, Egyházás, Hollós, Hungary: Birds' skins (37 specimens). Exchange. (D. 7939.)

Sturtz, B., Bonn, Prussia: Rocks (58 specimens). Exchange. (D. 8242.)

RUSSIA.

Kroustchoff, Dr. K. de, Petersburg: White tourmaline (2 specimens); granite chips (9 specimens). Exchange. (D. 8186.) (D. 8222.)

Pavlov, Prof. A., Moscow University, Moscow: Specimens of Cretaceous fossils. Exchange. (D. 8149.)

OCEANICA.

AUSTRALASIA.

Australia.

NEW SOUTH WALES: Australian Museum, Sydney: Duplicate echinoderms. Exchange. (D. 7908.)

QUEENSLAND: Queensland Museum, Brisbane: Duplicate rocks and ores (65 specimens). Exchange. (D. 7952.)

Polynesia.

HAWAII: Bernice Pauahi Bishop Museum, Honolulu: Photographs of Polynesian clubs; ethnological objects from Polynesia; specimens of kapa cloth. Exchange. (D. 8398.)

Tasmania.

Williamson, W. L., Brown's River, Hobart: Shells (128 specimens, 73 species). Exchange. (D. 8042.)

¹ Returned.

APPENDIX V.

THE WORK OF THE MECHANICS AND LABORERS.

The following is a condensed statement from the report submitted by the superintendent of buildings, Mr. Henry Horan, and is intended to indicate, in a general way, the character of the work performed during the year by the mechanics and laborers.

1893.

July.—The steam boilers were thoroughly overhauled, the valves, radiators, and steam pipes throughout the buildings were examined, and the boiler rooms renovated and whitewashed. The old iron watch-boxes in the Smithsonian building were replaced by new ones. A portion of the tile flooring in the rotunda was reset. Considerable painting and kalsomining was done in the rooms of the north-east pavilion recently vacated by the United States Geological Survey.

August.—The location of many of the radiators in the north-east pavilion was changed. The painters also continued their work in this part of the building. A small extension to the carpenter shop was built to provide for the accommodation of a glass-grinding machine, which will be driven by the gas engine. Considerable work was done in the east basement of the Smithsonian building.

September.—The lecture hall was put in condition for the meetings held from September 5 to 8 under the auspices of the Pan-American Medical Congress.

The cornices and roof trimmings of the Museum building were given a fresh coat of paint. Repairs were made to the floors in several of the exhibition halls. A fire plug was placed in the basement under the north entrance to the Smithsonian building. Toward the last of the month the work of repairing the ceiling of the bird hall, in the Smithsonian building, was begun under the direction of the Architect of the Capitol.

October.—A force of workmen was engaged in moving the offices and laboratories of the departments of reptiles and mammals to the north-east pavilion. The rooms vacated by the department of mammals at the south entrance were refitted. A number of carpenters and laborers were sent to Chicago to pack up and ship to Washington the material exhibited by the Museum at the World's Columbian Exposition.

November.—The osteological workrooms were removed to one of the sheds south of the Smithsonian building. A number of storage-cases were built and placed in position in the department of reptiles. The work of moving the alcoholic specimens belonging to this department to the new quarters in the north-east pavilion was carried on during the month. The exhibition cases in the west hall were rearranged, and also those in the anthropological hall. Alterations were made in the heating apparatus in the west-south range.

December.—All of the cases in the coral hall were cleaned and oiled. During the first part of the month preparations were made to receive the material returned from the World's Columbian Exposition. The first car load arrived on December 11, and the laborers were busy for many weeks unpacking the material. Some of the cases were temporarily removed from the fisheries hall, in order to provide space for the reception of the boxes and crates. The large stone reproduction of the Liberty Bell was removed from the department of geology and placed near the foot of the steps at the north-west entrance.

1894.

January.—The collection of models of boats was transferred to the west side of the boat hall, above the wall case. The work of unpacking the material received from Chicago was carried on during the month. A number of cases in the department of geology were refitted and painted. A hose reel, for use in case of fire, was built, and will be placed at the foot of the stairway in the south-east pavilion.

February.—The lecture hall was cleared and placed in condition for use, announcements having been made for two courses of lectures. The office of the curator of materia medica was removed from a room near the west entrance to the north-east pavilion. The exhibit of the department of insects was placed in storage, and that of the section of materia medica transferred to the north-east court. The cases containing the graphic arts collection were removed to the south-east range.

March.—Three large relief maps were fastened to the wall in the section of transportation and engineering, and a great deal of other work connected with the installation of exhibits in the various departments of the Museum was attended to during the month.

April.—Preparations were made for the meeting of the National Academy of Sciences, which was held from April 17 to 20, the lecture hall being used for the open meetings, and the offices in the north-west pavilion for meetings of committees, etc. The large clock in the telephone room was removed to the basement. Workmen were engaged in repainting the interior of the mahogany wall-case in the boat hall. A number of canoes, which could not be easily exhibited otherwise, were suspended from the ceiling by means of iron rods.

May.—The pressure of work incident to the return of exhibits from the World's Columbian Exposition being practically over, many of the laborers were employed in cleaning the exhibition halls and cases. The large Indian war canoe at the east front of the Museum was painted and oiled.

June.—The Hemenway collection of pottery was packed up for return to the owners. The material when ready for shipment occupied thirty-five boxes. Three new telephone instruments were installed in the Museum building and one in the Smithsonian building, with the necessary wires for connecting these instruments with the telephone room. The steam fitter was engaged in overhauling the steam-heating pipes, repacking the joints, etc. The fire hose in both buildings was also thoroughly overhauled, and fire-extinguishers were placed at various points about the buildings.

APPENDIX VI.

LIST OF ACCESSIONS TO THE U. S. NATIONAL MUSEUM, 1894.

The accessions of the year, which embrace Nos. 27151 to 28311, inclusive, are described in the following list, arranged alphabetically under the names of the senders.

- ABBOTT, DR. WILLIAM L. (Bombay, India): A valuable and interesting collection of birds' skins from Kashmir, reptiles from India, mammal skins and skulls, models of boats from Kashmir, and a basket and pouches from the Seychelles Islands; specimens of *Cypræa* from Flat Island, and specimens of *Helix* from Maché, Seychelles; specimen of *Calappa hepatica*, de Haan from Glorioso Island, Indian Ocean; 57 birds' nests, representing 10 species; also 16 birds' nests from the Vale of Kashmir and the Island of Maché. 27489.¹
- ABEL, J. C. (Lancaster, Pa.): Sixty-five stone relics and other archæological objects (27547); rude chipped implements, chips, flakes, hammers, and arrow-heads from a prehistoric workshop on the Conestoga hills (27784); 104 archæological objects, consisting of hammer-stones, rude chipped implements, arrow-heads, pestles, and other objects (27786); 309 arrow and spear-heads (27972); 47 chipped implements of white quartz and 1 of flint (28012); hammer and pitted stones, rude chipped implements, worked flakes, leaf-shaped implements, (28159); leaf-shaped implements, rude points, arrow-heads, and fragments of pottery (28172).
- ACADEMY OF SCIENCES (San Francisco, Cal.), through Dr. J. G. Cooper: Land shells from Lower California, and 13 species of marine shells from California. 28109.
- ADAIR, R. H. (Fort Smith, Ark.): Stalagmitic marble from Marion County, constituting a portion of the Arkansas exhibit at the World's Columbian Exposition. 27896. (See under Arkansas, State commission of, to World's Columbian Exposition.)
- ADAMS, A. F. (U. S. National Museum): Colored sands arranged in a bottle by Mr. A. Clements, of McGregor, Iowa, to represent pictures and figures. 27275.
- ADAMS, W. H. (Mineral City, Va.), through Dr. David T. Day: Geological material. 28229.
- ADAMS, W. W. (Mapleton, N. Y.): Three photographs representing clay vessels and pipes from Honeoye Creek (gift) (27977); 6,923 shell beads (wampum), found near Union Springs (purchase) (27978).
- AGASSIZ, Prof. ALEXANDER (Museum of Comparative Anatomy, Cambridge, Mass.): Shells from the Bahamas. 28253.
- AGRICULTURE, DEPARTMENT OF, through Dr. C. Hart Merriam: Fresh-water shells, representing 4 species from Nevada; *Limnæa stagnalis* from Elk River, Minnesota, and *Unio* and *Limnæa* from South Dakota, collected by Messrs. Vernon Bailey and A. K. Fisher (27446); through Prof. C. V. Riley, 2 snakes from Mexico, collected by Mr. Trujillo (27479); collection of North American insects, collected by Mr. D. W. Coquillett in southern California

¹Several reports relating to material received from Dr. Abbott, previous to and including this sending, have been published in the Proceedings of the National Museum, Nos. 915, 953, 970, 973, 976, 982, 983, and one paper in the Report of the National Museum for 1891.

- AGRICULTURE, DEPARTMENT OF—cont'd. (27578); fresh-water crustaceans from southern Mexico, collected by Mr. E. W. Nelson (28158).
- ALASKA COMMERCIAL COMPANY. (See under Prof. C. H. Gilbert.)
- ALDRICH, PERTIA W. (Belgrade Mills, Me.): Fox Squirrel, *Sciurus niger* (?) from Lake County, Ind. 27714.
- ALEXANDER, E. P. (Georgetown, S. C.): King Snake, *Lampropeltis getulus*, and Grass Snake, *Ophisaurus ventralis*. 28006.
- ALLEN, C. A. (Nicasio, Cal.), through Maj. Charles Bendire, U. S. A.: Five specimens, representing 3 species, of birds' skins from California, comprising Gambel's Sparrow, *Zonotrichia Gambeli*, Savanna Sparrow, *Ammodramus sandwichensis savanna*, and Western Savanna Sparrow, *Ammodramus sandwichensis alaudinus*. 27196.
- ALLEN, C. L. (Federal Park, N. Y.): Human skull, 12 arrow and spear-heads of flint, 3 arrow-heads of quartz and 3 copper spear-heads from Indian graves near Shiocton, Wis.; a grooved ax from Long Island; an argillite arrow-head from Jamaica, Long Island, and a fossil shell from the eastern coast of England. 27789.
- ALLEN, DR. J. A. (See under American Museum of Natural History.)
- AMERICAN ENCAUSTIC TILE COMPANY (Zanesville, Ohio): Encaustic tiles. 27552.
- AMERICAN KAOLIN WORKS (Philadelphia, Pa.): Silica brick made from pulverized quartz and feldspar, obtained from the exhibit of the Kaolin Works at the World's Columbian Exposition. 27885.
- AMERICAN MUSEUM OF NATURAL HISTORY (New York City): Eighty-four specimens, representing 35 species, of birds' skins from Chapada, Matto-Grosso, Brazil (27372); through Dr. J. A. Allen, skin of Mogollon Mountain Squirrel, *Sciurus hudsonius mogollonensis* (27440). Exchange..
- AMERICAN TRIPOLI COMPANY (Carthage, Mo.): Nine tripoli disks, cylinders, and tubes; also 2 concretions from Seneca, Mo., selected from the exhibit of the company at the World's Columbian Exposition. 27879.
- ANCEY, C. F. (Dra-et-Mizan, Algeria): Two rare species of African fresh-water bivalves (27436); 30 species of shells, principally from Africa and New Caledonia (27519). Exchange.
- ANDREWS, DR. E. A. (Johns Hopkins University, Baltimore, Md.): Eleven specimens of Lancelet, *Asymmetron lucayanum*, Andrews; representing a new species, collected at North Bemini, Barbadoes. 27526.¹
- ANDREWS, HON. HENRY W. (United States consul, Hankow, China), through Department of State: Three birds' skins. 27476.
- ANTHONY, A. W. (San Diego, Cal.): Six eggs (1 set) of San Pedro Partridge, 2 eggs (1 set) of Townsend's Junco, with nest (both new to the Museum collection) (gift), nest and 2 eggs of Townsend's Junco (deposit) (27271); 12 birds' skins, representing 2 species, from Lower California, and 6 skins of *Junco Townsendi*, Anthony (new to the Museum collection) (exchange) (27324); egg of Xanthus's Murrelet from Coronado Island (deposit) (27347); lizards from southern California (deposit) (27508); specimen of anomuran, probably belonging to the genus *Galathea* (gift); 2 alcoholic specimens of *Eurytelma Steindachnerii*, Auss., from Coronado Island, off San Diego (gift) (27536); 2 specimens, male and female, of Anabel's Bluebird, *Sialia mexicana Anabete*, Anthony, and 1 specimen of Guadalupe Petrel, *Oceanodroma macrodactyla*, Bryant, from Lower California and Guadalupe Island, respectively (both new to the Museum collection) (exchange) (27662).
- ANDRUS, W. J. (Hackensack, N. J.): Domestic fowl. 28019.
- APPERSON, DR. JOHN S. (See under Virginia, State commission of, to World's Columbian Exposition.)
- APPLETON, CAPT. NATHAN (Boston, Mass.): Sixty early Spanish, Mexican, West Indian, and miscellaneous copper and silver coins, sword-bayonet, cartridge-box and belt, large shot, needle of a needle-gun—all relics of the Franco-Prussian war—18 photographs relating to the Paris Commune, etc., and an

¹ Described in Johns Hopkins Biology, October, 1893.

APPLETON, Capt. NATHAN—continued.

illustration of the dredge boat. *Nathan Appleton*, used on the Panama Canal. 28140.

ARKANSAS, STATE COMMISSION OF, TO THE WORLD'S COLUMBIAN EXPOSITION, through R. H. Adair and Clio Harper, Fort Smith: Specimens of *elæolite*, *syenite*, and *zinc*, *manganese*, and *antimony ores*, from the Arkansas exhibit at the World's Columbian Exposition. 27895.

ARMISTED, L. C. (Hendersonville, Tenn.): Twenty-nine archaeological objects from an Indian burial mound in Sumner County. 28049.

ARMSTRONG, GEORGE W. (De Beque, Colo.): Photograph of the head of a Mule Deer, *Cariacus macrotis*. 28149.

ARMSTRONG, J. P. (See under Prof. T. D. A. Cockrell.)

ATTWATER, H. P. (Rockport, Tex.): Eight eggs of Texan Seaside Sparrow, 4 eggs of Cassin's Sparrow, 23 eggs of Gray-tailed Cardinal, 9 eggs of Brown Pelican, 5 eggs of Royal Tern, 8 eggs of Cabot's Tern, and 7 birds' nests (purchase) (27345); 5 eggs of Brown Pelican, 5 eggs of Royal Tern, 12 eggs of Cabot's Tern, 5 eggs of Golden-fronted Woodpecker, 13 eggs of Western Lark Sparrow, 6 eggs of Orchard Oriole, 8 eggs of Scissor-tailed Flycatcher, 21 eggs of Gray-tailed Cardinal, 5 birds' nests (gift) (27346); through Maj. Charles Bendire, U. S. A., Horned Toad, *Phrynosoma cornutum* (gift) (27419); 1 skin each of *Ammodramus maritimus Sennetti* and *Peucea Cassini* (purchase) (27449); through Maj. Charles Bendire, U. S. A., 2 specimens of Texan Prairie Hen, *Tympanuchus Attwateri*, from Aransas County (gift) (27554); 12 specimens of Texan Seaside Finch, *Ammodramus maritimus Sennetti*, from near Rockport (gift) (27584); 2 skins of Blue-faced Booby, *Sula cyanops* (purchase) (27698); through Maj. Charles Bendire, U. S. A., 2 skins of Southern Prairie Hen, *Tympanuchus Attwateri* from Jefferson County (gift) (27811); skin of Rock Sparrow, *Peucea rusticeps eremæa*, and 4 skins of Golden-cheeked Warbler, *Dendroica chrysoparia* (gift), nest and 5 eggs of Rock Sparrow, nest and 6 eggs of Black-crested Titmouse, nest and 4

ATTWATER, H. P.—continued.

eggs of Rough-winged Swallow, 2 eggs of Black Vulture, 2 eggs of Rio Grande Turkey, and nest and egg of Golden-Cheeked Warbler (purchase) (28261); 5 eggs of Attwater's Prairie Hen (new to the Museum collection) (gift) (28262).

AUSTRALIAN MUSEUM (Sydney, New South Wales), through Mr. S. Sinclair, secretary: Echinoderms (27182); skeleton of *Graculus melanoleucus*, 2 skins of *Graculus melanoleucus*, 2 of *Graculus varius*, and 2 of *Graculus sulcirostris*. (27358.) Exchange.

AVERY, S. P. (New York City): Pamphlet entitled "Catalogue of engravings," etc., by Charles Burt (27472); engraving (bookplate) by C. W. Sherborn (27680); 2 etchings by Ludwig Knaus (27748).

AVERY, Dr. W. C. (Greensboro, Ala.): Stuffed rattlesnake. 27541.

AYRES, H. B. (Carlton, Minn.): Slab of polished quartzite. 27782.

BABBITT BROS., (Flagstaff, Ariz.): Rock containing native sulphur, from Colorado Cañon. 27540.

BAGG, G. T. (See under Wm. Villiers Brown.)

BAILEY, A. and V. (Elk River, Minn.): Specimens of *Physonota unipunctata*. 27441.

BAILEY, E. M. (Andover, Me.): Specimens of columbite, garnet, tourmaline, trip-lite, and other minerals from Rumford. Exchange. 27594.

BAILEY, VERNON (Department of Agriculture): Rock, containing seeds of *Celtis*, from a cliff at Sydney, Nebr., and fossil wood from the New Fork of Green River and the North Fork on the east side of New Fork, Wyoming. 27490. (See under Department of Agriculture.)

BAKER, C. F. (Fort Collins, Colo.), through L. O. Howard: Eight hundred specimens of Chalcididæ. 27958.

BAKER, Dr. FRANK. (See under Smithsonian Institution, National Zoological Park; also under John Welch.)

BALDWIN, D. C. (Elyria, Ohio): Plaster cast of a carved stone pipe, the original of which was found near New Comers-town, Ohio. 27220.

- BALLARD, Dr. F. A. (National Military Home, Leavenworth County, Kans.): Flint nodule. 27548.
- BARBER, A. P. (Homer, La.): Ourang outang (deposit). 27787.
- BARBER, A. W. (Washington, D. C.): Small quartz arrow-head, found in sand and gravel dredged from the bottom of the Potomac River. 27621.
- BARBER, DANIEL (Washington, D. C.): Scorpion (*Buthus carolinensis*). 27516.
- BARROWS, D. B. (Lacon, Ill.): Nine eggs (3 sets) of Yellow-billed Cuckoo and 3 nests. 27254.
- BASSETT, L. R. (Kissimee, Fla.): Stag beetle, *Strategus antæus* Fab. 27415.
- BAUMER, JOHN (Omaha, Nebr.): Open-face gold watch (deposit). 27575.
- BAUR, Dr. GEORGE (University of Chicago, Chicago, Ill.), through Dr. George Marx: Collection of spiders from Galapagos Islands. (Portion returned.) 27914.
- BEACH, J. S. (Jacksonville, Fla.), through Isaiah Greeger: Shell hatchet, or adze. 28161.
- BEALL, Miss LOUISA (Mattoon, Ill.): Specimen of *Dryocampa rubicunda*, Fab. 28151.
- BEAN, BARTON A. (U. S. National Museum): Small collection of fresh-water fishes from Pennsylvania, and specimen of *Cryptobranchus alleghaniensis*, from the Susquehanna River (27349); Owl Moth, *Homoptera edusa* (28219).
- BEAN, Dr. T. H. (U. S. Fish Commission): Two specimens of Brook Trout (albino), *Salvelinus fontinalis*, and specimens of the same species deformed. 27214.
- BECK, C. W. (Philadelphia, Pa.): Chromotype portrait of the late George W. Childs. 28000.
- BECK, R. H. (Berryessa, Cal.), through Maj. Charles Bendire, U. S. A.: Thirteen birds' skins. 28230.
- BEECHER, Dr. C. E. (Yale College, New Haven, Conn.): Two specimens of *Triarthrus Becki* in the unsegmented stage of growth. 27655.
- BELDING, L. (Stockton, Cal.): Collection of lizards (27206); through Maj. Charles Bendire, U. S. A., 2 specimens of Thurber's Snowbird, *Junco hyemalis Thurberi*, from Big Trees (27280); 10 birds' eggs and 5 nests (27295).
- BELL, CHARLES (Nickel, Nev.): Nickel ores. 27613.
- BELL, Judge JAMES (Gainesville, Fla.): Loon, *Urinator imber*, in the flesh (27618); living rattlesnake (transferred to the National Zoological Park) (27920).
- BEMENT, C. S. (Philadelphia, Pa.): Specimens of monazite, spinel, beryl, fluorite, halite, siderite, mendipite, quartz, binnite, and pyrrhotite from various localities (gift) (28205); meteorite from Rockport, Tex., and one from Borkut, Marmaros, Hungary (exchange) (28206).
- BENDIRE, Maj. CHARLES, U. S. A. (See under C. A. Allen, H. P. Attwater, Rollo H. Beck, L. Belding, R. H. Lawrence, Chase Littlejohn, E. A. McIlhenny, Charles Nichols, Dr. William L. Ralph, S. F. Rathbun, and R. S. Williams.)
- BENEDICT, JAMES E. (U. S. National Museum): Crustaceans, echini, and worms from Pensacola, Fla. (27235); two snakes from Woodside, Md. (27268); Barn Owl, *Strix pratincola* (27630). (See under J. E. Kauser.)
- BENJAMIN, MARCUS (New York City): Engraved portrait of John Henry Alexander, and an autograph letter of S. C. Chandler, members of the National Academy of Sciences. Deposit. 27952.
- BENJAMIN BROS., (Cincinnati, Ohio): Sample of burnt-in work on a china plate. 27493.
- BENNETT, C. A. (See under Smithsonian Institution, Bureau of Ethnology.)
- BENSON, Lieut. H. C., U. S. A. (The Presidio, San Francisco, Cal.): Seventeen eggs (4 sets) of Desert Sparrow Hawk; 14 eggs (2 sets) of California Partridge; 5 eggs (1 set) of Lewis' Woodpecker; 5 eggs (1 set) of California Jay, from Santa Clara County (28210); skin of Hutton's Vireo, *Vireo Huttoni*, from Gilroy, Cal., with nest and 4 eggs (new to the Museum collection); nest and egg of hummingbird (28228).
- BENTLEY, J. J. (Sadorus, Ill.): Copper ornament and a small rubbing-stone, or muller, from a cave in Washington County, Pa. Deposit. 28142.
- BERLINER, S. (See under Cape of Good Hope Commission to World's Columbian Exposition.)

- BERNADOU, J. B., U. S. N.: Native map of Korea in 10 sheets. Deposit. 27260.
- BIDWELL, Gen. JOHN (Chico, Cal.), through H. W. Henshaw: Charm stone of the Maidu Indians of Sacramento Valley. 28187.
- BIEDERMAN, C. R. (Bonito, N. Mex.): Specimen of iron and 2 crystals (27325); mineral (27974).
- BIENENFELD, BERNARD (Chicago, Ill.): Asphalt from Kern County, Cal., selected from Mr. Bienenfeld's exhibit at the World's Columbian Exposition. 27876.
- BIGELOW, Dr. ROBERT P. (Kingston, Jamaica): Crustaceans collected in Kingston Harbor (27261); 2 species of *Stomatopoda* from the Bimini Islands, Bahamas (27378).
- BISHOP, Dr. L. B. (New Haven, Conn.): Nest and 4 abnormally colored eggs of Long-billed Marsh Wren. 27581.
- BLACK, WILLIAM (Birmingham, Ala.): Tortoise beetle, *Coptocyclus clavata*. 27469.
- BLACKBURN, EDWIN (Denver, Colo.), through T. W. Stanton: Specimen of *Receptaculites*, near *Receptaculites Oweni*, Hall, from a locality halfway between Poncha and Maysville, Colo. (28272); jaws of a fossil fish (28274).
- BLACKBURN, Dr. W. M. (Pierre University, East Pierre, S. Dak.): Clay concretions. 27451.
- BLAIN, H. A. (Springville, Ariz.): Ancient pottery from Socorro County (27239); wooden hoe from the same locality (27506); 4 pieces of mound pottery from Arizona (28050).
- BLANCHARD, JOHN (Boulder, Colo.), through T. W. Stanton: Internal cast of *Spirifer Loganii*, Hall, from the Keokuk formation at Galena, Kans. 28004.
- BLEKER, Prof. F. (See under St. Gothard Railway Company.)
- BLISS, Col. Z. R., U. S. A. (Fort Bayard, N. Mex.): Specimen of *Mantispa*, representing a new species. 28046.
- BOEHMER, GEORGE H. (Smithsonian Institution): Four unsigned colonial notes. 28299.
- BOLLES, Mrs. C. A. C. (Washington, D. C.): Samoan fly-flapper made of horse-hair; Alaskan photographs. Exchange. 27631.
- BONNET, ANDRÉ C. (Paris, France): Miocene fossils, representing 175 species, collected at Pontlevoy. Exchange. 27995.
- BORDEN, DANIEL (Somerset, Ky.): Epsomite. 27190.
- BOSWELL, HENRY (Washington, D. C.), through N. R. Wood: Two Silver Pheasants, *Gennæus nyctemerus* (27172); Golden Pheasant, *Chrysolophus pictus*, in the flesh. (28279).
- BOUDINOT, Mrs. E. C. (Fort Smith, Ark.): Two framed portraits, life-size, of the father and mother of Col. E. C. Boudinot (Cherokee Indians). 27207.
- BOURKE, Capt. JOHN G., U. S. A.: Part of a tumbler, the remainder of which was eaten by an Algerian dervish, together with a description of his dance (gift) (27518); 2 rawhide figures used in the "sun dance" at Red Cloud Agency, Nebr. (deposit) (27530).
- BOWLES, C. W. and J. H. (Ponkapog, Mass.): Thirteen eggs (2 sets) of Short-billed Marsh Wren, with 2 nests. 27973.
- BOYD, R. S. (Pittsburg, Pa.): Gun-flint, found in Pittsburg. 27970.
- BOYLE, Dr. DAVID (Ontario, Canada): Specimens of apatite, massive and in crystals; serpentine, with veins of asbestos, barite, tremolite, nickel, anti-mony, gold, platinum, and copper ores; selected from Dr. Boyle's exhibit at the World's Columbian Exposition. 27892.
- BRADLEY, TERREL (Lester Manor, Va.): Collection of Pamunkey pottery and stone implements. Deposit. 27200.
- BRADY, SAMUEL (Detroit, Mich.): Two copper boulders, from Central Mine, Mich.; specimen of chrysotile, from Ishpeming, and datolite, from Lake Superior; also piece of "brick" copper, from the Peninsula mine, Michigan. 27770.
- BRANDYWINE FELDSPAR AND KAOLIN COMPANY (Philadelphia, Pa.): Specimens of feldspar selected from the exhibit of the company at the World's Columbian Exposition. 27890.
- BRENIMAN, A. M. (Washington, Pa.): Twenty-one arrow-heads and 8 glass beads (surface finds) from Lancaster County. 27777.
- BRETHERTON, B. J. (Kadiak, Alaska): Two eggs (1 set) of Pigeon Guillemot. 28208.

- BRETT, WALTER (Lakeport, Cal.): Two skins of Red-bellied Hawk, *Buteo lineatus elegans*, 2 skins of *Tamias Townsendi hindsi*, and a skin each of *Thomomys botti*, *Dipodomys californicus*, and *Spermophilus mammurus Douglassii*. 27491.
- BREWSTER, WILLIAM (Cambridge, Mass.): Two eggs of American Golden-eye Duck from Maine, and nest and 4 eggs of Black-headed Vireo from Nova Scotia (gift) (27646); nest and 5 eggs of Bay-breasted Warbler from Nova Scotia, and 1 egg of Sulphur-bellied Flycatcher from Mexico, both new to the Museum collection (deposit) (27647). (See under Dr. R. W. Shufeldt.)
- BREZINA, Dr. ARISTIDES (Director, Museum of Natural History, Vienna, Austria): Large mass of cave gypsum from Krausgrötte Gams, Upper Styria. Exchange. 27498.
- BRIMLEY, H. H. and C. S. (Raleigh, N. C.): Two specimens of frog (*Engystoma carolinense* (gift) (27253); specimen of *Ophibolus sypsilus* (purchase) (27758); striped snake, swift, and 4 mud turtles (purchase) (28260); Spade-foot, *Scaphiopus couchii*, from Waco, Tex. (purchase) (28302).
- BRISBIN, EDWARD (Boise City, Idaho), through James M. Wells, State commissioner of Idaho to World's Columbian Exposition: Block of jasper from the exhibit of Idaho at the World's Columbian Exposition (27872); geode (27966); opal (28123).
- BRITISH GUIANA COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION, through J. J. Quelch, commissioner: Collection of insects, 51 birds' skins, representing 42 species (several new to the Museum collection), and birds' eggs obtained from the exhibit of British Guiana at the World's Columbian Exposition. 27826.
- BRITISH MUSEUM (London, England), through Dr. David Sharp, Cambridge Museum, Cambridge, England: Five hundred and seventy-four specimens of micro-hymenoptera, representing 260 species, including 21 types by Riley and 206 types by Ashmead; 689 specimens of hemiptera-heteroptera, representing 170 species, including numerous types by Uhler. 28271.
- BROADBENT, Captain. (See under Benjamin Harrison.)
- BROOKS, Dr. J. HENRY (Brookland, D. C.): Two specimens of Forster's Tern, *Sterna Forsteri*, from Texas. 27500.
- BROWN, CHARLES F. (Hot Springs, Ark.): Minerals. Exchange. 27181.
- BROWN, HERBERT (Tucson, Ariz.), Snakes, *Lichanura* (27284, 27539), skins of Zone-tailed Hawk, *Buteo abbreviatus*, from Arizona (27643); 2 skins of wood rat *Neotoma pinetorum*, 2 specimens of *Crotaphytus Baileyi* and *Crotaphytus Wislizenii* (28227).
- BROWN, J. S. (Knoxville, Tenn.): Four-dollar bill issued by authority of the Continental Congress, April 2, 1776. 27189.
- BROWN LUKE, J. (Lewinsville, Va.): Rhinoceros beetle, *Dynastes tityus*. 27185.
- BROWN, Lieut. R. M. G., U. S. A. (See under Intercontinental Railway Commission.)
- BROWN, R. W. (Washington, D. C.): Snake (*Heterodon*) (27322); 2 spiders (28292).
- BROWN, THOMAS H. (See under South Dakota, State Commission of, to the World's Columbian Exposition.)
- BROWN, WILLIAM HARVEY. (See under Smithsonian Institution, U. S. National Museum.)
- BRUMM, E. B. (Shenandoah, Pa.): Watch-Deposit. 27535.
- BROWN, WILLIAM VILLIERS (Townsville, Queensland), through G. T. Bagg: Three sets of fire-sticks and a message-stick from New South Wales. 27456.
- BRUNER, J. K. (Raleigh, N. C.): Specimen of opaque beryl from Mitchell County. 27633.
- BÜCHELER, CHRISTIAN (Lanham, Md.): Woodchuck, *Arctomys monax*. 28249.
- BUCK, Rev. D. S. (Lepanto, Ark.): Small mammal bone found in a mound near Lepanto, also 2 blue prints and 3 photographs of pottery discovered in the same mound. 28170.
- BULGARIAN COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION. (See under Sophia Museum.)
- BULLMAN, CHARLES L. (Buenaventura, Republic of Colombia, South America): Marbles used by Indian boys on the west coast of Colombia, and red paint (anatto) used by the Indians of El Choco, Colombia. 27480.

- BURGE, G. W. (Mount Vernon, Iowa): Five eggs (2 sets) of Great Horned Owl, 3 eggs (1 set) of Red-tailed Hawk, 2 eggs (1 set) of Caspian Tern, and 3 eggs of Whippoorwill. Exchange. 27822.
- BURGER, PETER (U. S. National Museum): Bat (*Vespertilio lucifugus*). 27315.
- BURNETT, JOHN (Needmore, N. C.): Pyrrhotite. 27246.
- BURNS, W. R. (Concord, Ky.): Fourteen Indian arrow-points from Lewis County, and a specimen of mineral (27513); 33 flint implements and other objects from the same county (27686).
- CAIRNS, JOHN T. (Weaverville, N. C.): Four eggs (1 set) of Mountain Solitary Vireo, and 3 eggs (1 set) of Black-throated Blue Warbler. 27191.
- CALL, R. ELLSWORTH (Louisville, Ky.): Specimens of *Strepomatidæ* from the Falls of the Ohio. 27679.
- CALL, Dr. S. J. (Paso Robles, Cal.): Skin of Audubon's Warbler, *Dendroica Auduboni*. 27775.
- CAMP, J. H. (Leopoldville, Congo, West Central Africa): Ethnological objects, insects, seeds, reptiles, crabs, mammals, fishes, shells, and specimens of resin from Africa. 27389.
- CAPE OF GOOD HOPE COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION, through S. Berliner, secretary: Specimens of peridotite, crocidolite, copper ores, and asbestos obtained from exhibit of Good Hope at the World's Columbian Exposition.
- CAPWELL, V. L. (Luzerne, Pa.): Silk moth (*Attacus cecropia*, L.). 27945.
- CARNE, JOSEPH E. (See under department of Mines and Agriculture, New South Wales.
- CARPENTER, A. S. (Trenton, N. Y.): Sand concretions. 27820.
- CARPENTER, Miss FLORENCE (Stockton, Cal.): Specimen of *Ammonites Redmondi*, Gabb, from the north fork of Cottonwood Creek, Shasta County. 27628.
- CARPENTER, Capt. W. L., U. S. A. (Sacketts Harbor, N. Y.): Nest and 4 eggs of Red-winged Blackbird (28223); 7 eggs of kingfisher (28240); 4 eggs (1 set) of Wood thrush (27269).
- CARSON, GEORGE C. (El Paso, Tex.): Nodules of calcite from Mexico. 27637.
- CASELL, Capt. W. H. (See under Druid Hill Park.)
- CASTRO, CARLOS. (See under Salvador, National Museum of.)
- CEYLON COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION: Pair of buffalo horns, 4 pairs of elk horns, 3 pairs of spotted horns, 8 pairs of small horns, lower jaw of a wild boar; ethnological objects, brass lamp, iron lamp, tin lamp, 6 stone lamps, and an earthen lamp; scales, lace pillow; ferryboat, covered boat, bamboo bridge, 7 boats, photograph, views of Kendesala ferryboat; specimens of graphite and pipe-clay; 5 drums, flute, 2 Scere crows, oboe; incense cage, scent sprinkler; 3 models of fish traps and a native net, obtained by purchase from the exhibit of Ceylon at the World's Columbian Exposition. 27839.
- CHADWICK, Mrs. CORNELIA J. (Washington, D. C.): Suit belonging to a Breton woman, consisting of a jacket, bodice, lace cap, bonnet, apron, and necklace. Deposit. 28236.
- CHAMBERLAIN, Rev. L. T. and Mrs. FRANCES LEA (Philadelphia, Pa.): Fifty-three land and fresh-water shells from Asia, Africa, and South America (27165); Unionidæ, representing 66 species from Burmah (27177); Unionidæ from New Zealand (27416); recent Unionidæ and other specimens from Africa, Asia, and Borneo (27732); Unionidæ from Asia and Australia (27813).
- CHAMBERLAIN, Rev. L. T. (Philadelphia, Pa.): Unionidæ, representing 81 species, principally from Asia, Tasmania, Africa, and South America (27905); a large collection of marine shells, formerly the property of Mrs. Frances Lea Chamberlain (28200); meteorite from Searsmont, Me. (bequeathed to the Lea collection by Mrs. Chamberlain) (28207); 1,316 specimens of cut gems and ornamental stones, formerly belonging to Mrs. Chamberlain (bequeathed to the Lea collection by Mrs. Chamberlain) (28234); shell bottle, dried specimens of barnacles, worm tubes, etc., formerly the property of Mrs. Chamberlain (28242); 2,246 specimens of quartz from various localities (bequeathed to the Lea collection by Mrs. Chamberlain) (28246); collection of

- CHAMBERLAIN, Rev. L. T.—continued.
gemminerals from various localities (bequeathed by Mrs. Chamberlain) (28256); unios from New Zealand (28265).
- CHAMBERLAIN, Mrs. FRANCES LEA. (See under Rev. L. T. Chamberlain.)
- CHANLER, WILLIAM ASTOR (New York City): Alcoholic reptiles from Africa, about 300 specimens of insects of all orders, collected by Mr. Chanler on "Jombéné Range," East Africa. 28162.
- CHASE, JULIUS M. (West Eaton, N. Y.): Fragment of the "Council Rock" of the Six Nations. 27202.
- CHERRIE, GEORGE K. (See under Costa Rica, National Museum of.)
- CHILEAN COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION: Nitrate of soda from the province of Tarapaca, Chile, obtained from the exhibit of Chile at the World's Columbian Exposition. 27897.
- CHILSON; STEPHEN (Santa Ana, Cal.): Tourmaline crystals. 27381.
- CHILTON, CHARLES (Port Chalmers, New Zealand): Sixty-one crustaceans from New Zealand. Exchange. 27825.
- CLAPP, GEORGE H. (Pittsburg, Pa.): Specimens of *Vitrina limpida*, Gld., from Pennsylvania. 27660.
- CLARK, HUBERT L. (Pittsburg, Pa.): Four specimens of *Nyctidromus albicollis*, 1 specimen of *Speotyto cunicularia hypogaea*, and 1 specimen of *Megascops asio McCalli*. 27954.
- CLARK, Judge J. N. (Saybrook, Conn.): Twelve eggs (3 sets) of Seaside Sparrow, with 3 nests, and 9 eggs (2 sets) of Sharp-tailed Sparrow. 27303.
- CLARKE, Prof. F. W. (U. S. Geological Survey): Six specimens of commercial chromo-lithography, with duplicates (27804); fragment of a meteorite from Pricetown, Ohio (28258). (See under R. De Kronstehoff; Interior Department exhibit to the World's Columbian Exposition; Dr. H. S. Lucas, New South Wales Commission to the World's Columbian Exposition and also Otsuka Usaburo.)
- CLEMENTS, A. (See under A. F. Adams.)
- COCKERELL, Prof. T. D. A. (Las Cruces, N. Mex.): Specimens of *Apus* and *Estheria*, collected by Mr. J. P. Armstrong at Engle, N. Mex. (28028); box tortoise (28287).
- COFFIN, FRANK S. (Cuero, Tex.): Luna moth. 27383.
- COHREN, W. F. (McElhattan, Pa.): Cecropia Silk Moth. 28155.
- COLE, F. H., & Co. (Hot Springs, S. Dak.): Cycad trunk. Purchase. 27463.
- COLEMAN, Prof. A. P. (School of Practical Science, Toronto, Canada): Twelve specimens of fossil Unionidæ. 27504.
- COLLINS, Dr. H. F. (Tucson, Ariz.): Grasshopper (*Dictyophorus picticornis*, Thom.), and a nest of the Trap-door Spider. 27351.
- COLOMBIA, U. S. of. (See under Government of the United States of Colombia.)
- COMMERCIAL MUSEUM (Brussels, Belgium), through Mr. A. Le Ghait, of the Belgian legation, Washington: Specimens of coal. Exchange. 28134.
- CONGER, C. A. B. (Washington, D. C.): Specimen of *Vermicularia spirata* from Florida. 28089.
- CONYNGTON, THOMAS (Fort Worth, Tex.): Asphaltic sand from the Indian Territory. 28054.
- COOK, Prof. O. F. (Huntington, N. Y.): Collection of ethnological objects, musical instruments, alcoholic reptiles, specimen of goby (*Eleotris*) electric fish, *Malapterurus electricus*, and two bats (*Epomopus franqueti* and *Vesperugo tenuipinnis*) from Africa. 27475.
- COOK, THOMAS, & SON (New York City), through Messrs. F. Sage & Co.: Model of the temple of Edfour, Egypt, lent from Mr. Cook's exhibit at the World's Columbian Exposition. 27858.
- COOPER, Dr. J. G. (See under Academy of Sciences, San Francisco, Cal.)
- COPP, J. B. (Old Mystic, Conn.): Articles of wearing apparel worn in New England from 1700 to 1750, and household utensils used on the Copp estate in Boston from 1688 to 1775. Deposit. 28273.
- COPPER QUEEN CONSOLIDATED MINING COMPANY (New York City), through Mr. George Notman, secretary: Copper ores from the company's mines at Bisbee, Ariz. 28114.
- COQUILLET, D. W. (See under Department of Agriculture.)
- CORNETT, HENRY B. (Greenville, Ky.): Sixty bone implements, 28 arrow-points, stone implement, fragments of pottery

- CORNETT, HENRY B.—continued.
from a burial-mound near Greenville;
also 2 fossil shells and a fossil coral.
27321.
- COSTA RICA COMMISSION TO THE WORLD'S
COLUMBIAN EXPOSITION: Collection of
skins and mounted mammals, 38 birds'
skins, representing 20 species, obtained
from the exhibit of Costa Rica at the
World's Columbian Exposition. 27852.
- COSTA RICA, NATIONAL MUSEUM OF (San
José, Costa Rica), through George K.
Cherrie: Type specimen of *Formicarius*
nigricapillus, Cherrie, from Buena Vista
(gift) (27266); type specimen of *Bu-*
thraupis ceruleigularis, Cherrie, from the
same locality (gift) (27267); type speci-
men of *Xiphorhynchus grandis*, Cherrie
sp. nov. (gift) (27404); dried plants
from Costa Rica (exchange) (28127).
- COX, PHILIP (St. John, New Brunswick):
Four specimens of Cyprinoid fish,
(*Phoxinus*) from a small lake in St.
John County. 27356.
- COX, ULYSSES O. (State Normal School,
Mankato, Minn.): Prairie Sharp-tailed
Grouse, *Pediocates phasianellus campe-*
stris, and 3 specimens of Lark Bunting,
Calamospiza melanocorys (27215); type
specimen of *Pipilo orizaba*, Cox, sp. nov.
from Mount Orizaba, Mexico (28076).
- COX, W. V. (chief clerk, U. S. National
Museum): Two specimens of Maple-tree
bug, *Brochymena annulata*, Fab. (27926);
mole (*Scalops aquaticus*) (28002).
- CRAIN, H. E. (See under Wyoming, State
Commission of, to the World's Colum-
bian Exposition.)
- CRAVEN, L. ADELLA (Galesburg, Ill.):
Cecropia Silk-moth. 27167.
- CRAWFORD, Hon. JOHN M. (United States
consul-general, St. Petersburg, Russia):
A very interesting collection of ethno-
logical objects and musical instruments
from Finland, collected by Mr. Crawford
for the National Museum. 27401.
- CREVECOEUR, F. F. (Onaga, Kans.):
Eleven specimens of lepidoptera and 1
specimen of coleopterous insect. 27408.
- CROCKER, Dr. M. M. (Gila Bend, Ariz.):
Gecko, *Coleonyx variegatus*. 27603.
- CROSBY, F. W. (Washington, D. C.):
Sulphur ores from Sicily (27157); col-
lection of volcanic sublimation prod-
ucts and ejectamenta from near Naples
(27310). Purchase.
- CROSBY, Prof. W. O. (Massachusetts In-
stitute of Technology, Boston, Mass.):
Geological material from Medford
(27766); faulted rock (28241). Ex-
change.
- CROSS, WHITMAN. (See under Interior
Department, U. S. Geological Sur-
vey.)
- CULIN, STEWART (University of Pennsyl-
vania, Philadelphia, Pa.): Gambling
board. Deposit. (Returned.) 28291.
- CUNNINGHAM, BURTON L. (Fort Kla-
math, Oreg.): Twenty-three butter-
flies, representing the genus *Argynnis*
(27447); nest and 4 eggs of Thurber's
Junco (27801).
- CUSHING, F. H. (Bureau of Ethnology):
Fifty-nine pieces of steatite vessels
from an aboriginal quarry at Rose Hill,
Washington, D. C. 27528.
- CUSHMAN, SAMUEL (Agricultural Experi-
ment Station, Kingston, R. I.): Five
living capons. 27512.
- DALE, T. NELSON (Williamstown, Mass.),
through Hon. C. D. Walcott, Director
U. S. Geological Survey: Concretionary
sands from 2 miles southeast of Still-
water, on the Hudson River. 27590.
- DALL, WILLIAM H. (U. S. Geological
Survey): Stemmed flint cutting tool
or scraper, from Bainbridge, Mass.
(27629); 2 rude flint implements, 11
flakes, 2 arrow-heads, and 9 fragments
of pottery from a kitchen midden,
near Chattahoochee, Fla. (27973); spec-
imen of *Murex Leeanus*, Dall from
Guadalupe Island, Lower California
(28020).
- DANIEL, Dr. F. E. (Austin, Tex.): Blind
snake, *Leptotyphlops*. 27642.
- DANIEL, L. S. (Victoria, Tex.): Pseudo-
morph of turgité, from Pecos County.
27342.
- DANIEL, Dr. Z. T. (Pine Ridge Agency,
S. Dak.): Bracelet worn by the wife of
Lone Dog, a celebrated chief engaged
in the Custer massacre (27353); a lock
of hair taken from the head of an In-
dian after the battle of Wounded Knee
Creek, shinney-stick from Pine Ridge
Agency, and a bullet from the same
locality (27517); brush obtained from
Blackfeet Indians of Montana (27773);
24 drawings made by Indian pupils
(28069).

- DARTON, N. H. (See under Interior Department, U. S. Geological Survey.)
- DAVIS, FRANK P. (Washington, D. C.): Ten photographs representing antiquities on the island of Zapatero, Lake Nicaragua, alcoholic specimens of insects, reptiles, crustacean, Chestnut-headed Sloth, *Arctopithecus castaneiceps* (?), Hoffmann's Sloth, *Cholopus Hoffmannii*, and opossum, *Didelphis quica* (?), alcoholic specimens of *Scombroides*, *Caranx*, *Trachynotus*, *Vomer*, *Chatodipterus*, *Batrachoides*, *Gerres*, *Mugil*, *Polynemus*, *Centropomus*, *Marengula*, *Menticirrus*, *Rhypticus*, *Larimus*, *Umbrina*, and *Lutjanus* from Central America (27355); 3 photographs of hieroglyphics on the rocks near Masaya, Nicaragua, and a collection of diamond-drill borings from the site of one of the proposed dams on the Nicaragua Canal (27740).
- DAWES, Mrs. W. C. (Phoenix, Ariz.): Hawk Moth, *Triplogon occidentalis*. 28047.
- DAWSON, Sir WILLIAM (McGill University, Montreal, Canada): Piece of limestone containing specimens of *Loftusia columbiana*, and 3 thin slides of the same. 28197.
- DAY, ALFRED. (See under Richard J. L. Price.)
- DAY, Dr. DAVID T. (U. S. Geological Survey.) (See also under W. H. Adams.)
- DEAN, E. E., and ALEXANDER MADELL (Buffalo Gap, S. Dak.): Large block of siliceous conglomerate, selected from the exhibit of Idaho at the World's Columbian Exposition. 27899.
- DEAN, SAMUEL B. (Arlington, Mass.): Columbian jug designed by Mr. Dean in 1893, with a printed description of the same (gift) (27967); collection of lighting apparatus and specimens of pottery (purchase) (28093).
- DECHERT, W. H. (New Chester, Pa.): Eight arrow-heads and 2 perforators from Adams County, Pa. 27622.
- DECKER, J. N. (Youngstown, Ohio): Watch. Deposit. 27558.
- DE KROUSTCHOFF, R. (Through Prof. F. W. Clarke.) Euclase crystal from Sankarka River, Siberia (27367); 14 meteorites (27385).
- DEPARTMENT OF MINES AND AGRICULTURE (New South Wales), through Joseph E. Carne and Hon. C. D. Walcott: One hundred and sixty-nine Silurian, Devonian, and Carboniferous invertebrate fossils, Mesozoic invertebrates, fossil plants, and fossil vertebrates (also blackfellows' stone implements, gift), constituting a portion of the New South Wales Commission to the World's Columbian Exposition. Exchange. 27900.
- DE RONCERAY, Miss E. (Smithsonian Institution): Three birds' skins from California. 28306.
- DESERET MUSEUM (Salt Lake City, Utah), through Dr. J. E. Talmage, president: Collection of selenite crystals. Exchange. 27549.
- DESMOND, J. J. (U. S. National Museum): Homing pigeon. 28079.
- DE VIS, C. W. (See under Queensland Museum.)
- DEXTER, Hon. LEWIS (U. S. Consul, Fayal, Azores): One hundred and fifty-two land-shells, representing 76 species from Madeira. Purchase. 28212.
- DEYROLLE, EMILE (Paris, France): Enlarged model of a starfish. Purchase. 28180.
- DI BRAZZA, Countess CORA (Italy): Two lace pillows, and 1 costume of a lace-maker, also a chair used by lace makers, representing the lace-making industry in Italy as illustrated at the World's Columbian Exposition. 27848.
- DILLE, T. M. (Denver, Colo.): Twelve eggs (2 sets) of American Magpie. 27661.
- DODGE, BYRON E. (Richfield, Mich.): Four hundred and eighty-seven archaeological objects and a human skull from Genesee County. Deposit. 28015.
- DOLAN, JOHN J. (U. S. National Museum): Rabbit. 27963.
- DOLBEAR, C. E. (Bethany, Va.): Decorated sigillaria. 27170.
- DOUGAL, WILLIAM H. (Washington, D. C.): Dry-ground aquatint scale-plate. 27805.
- DOWLING, THOMAS (Washington, D. C.): Two engravings. 27962.
- DRESEL, Lieut. H. G., U. S. N. (Norfolk, Va.): Skin of Guacharo, *Steatornis steatornis*, from Trinidad. 28090.

- DROPSIE, MOSES A. (Philadelphia, Pa.): Jewish passover cloth, printed on silk, from Jerusalem. 27985.
- DRUID HILL PARK (Baltimore, Md.), through Capt. W. H. Cassell, superintendent: Camel, in flesh. 27445.
- DUGÈS, DR. ALFRED (Guanajuato, Mexico): Specimen of *Cicada hilaris*, Dist. (27158); bombycid larva parasitized by *Apanteles* sp. (27482); specimen of *Amophila gryphus*, Smith (27560).
- DUN, M. A. (Montgomery, La.): Caudal vertebra of cetacean, from a marl bank on Red River, La. 27453.
- DUNHAM, Mrs. G. F. (Tunis Mills, Md.): Two pitted stones of quartzite, and a hammer or rubbing stone of flint, from Talbot County. 28125.
- DUSTAN, E. W. (Philadelphia, Pa.): American Crow, *Corvus americanus*. 28098.
- EASLEY, C. W. (Henrietta, Tex.): Hair ball. 27980.
- EATON, Miss H. G. (Redlands, Cal.): Spider (*Peucetia aurora*, McCook). 27265.
- EBERSOLD, Mrs. T. F. (Oceanus, Fla.): Specimen of coquina, beach-worn coral, shells, small reddish bean with a black hilum, *Mucuna altissima*, and a large black bean, *Entada scandens*, pipefish, *Siphostoma*, ear bone and portion of the jaw of a skate, *Raia* sp., dytiscid beetle (*Cybister fimbriolatus*). 28270.
- EGYPTIAN GOVERNMENT, through Department of State: A valuable collection of mummy cases, coffin boxes, and 38 small funerary statues, from the Gizeh Museum. 27543.
- EIGENMANN, C. H. (Indiana University, Bloomington, Ind.): Alcoholic reptiles, type specimens of *Columbia transmontanus* and of *Coregonus Coullteri*. Exchange. 27774.
- EKMAN, CARL. (See under Grafversfors Granite Works, Tinspong, Swedish exhibit to the World's Columbian Exposition.)
- ELGUERA, Señor MANUEL (Peruvian Legation, Washington, D. C.): A raised and colored map of Peru, for ethnological purposes, and 3 maps of Peru from which the raised map was designed. 27763.
- ELROD, Prof. M. J. (Wesleyan University, Bloomington, Ill.): Specimens of *Pleurocera subulare*, Lea, from the Post-Pliocene formation, Mackinaw River (27387); skull of American Pika, *Lagomys* (27430); skin of Long-eared Owl, *Asio Wilsonianus*, and skin of Short-eared Owl, *Asio accipitrinus* (27699).
- EMMERICH, Lieut. C. F., U. S. N.: Japanese short sword and Japanese long sword. 27785.
- EMMONS, Lieut. G. T., U. S. N.: Eighty-eight ethnological objects obtained from the Tlingit Indians of Alaska. Exchange. 28072. (See under Interior Department, U. S. Geological Survey.)
- EMMONS, S. F. (See under Interior Department, U. S. Geological Survey.)
- ERVING, RANDALL M. (Intervale, N. H.): Indian arrow-head (27442); specimens of granite and decomposition products (27523). (See under R. W. Weeks.)
- EVANSVILLE PRESSED BRICK COMPANY (Evansville, Ind.): Shale used in brick-making. 27431.
- EVERMANN, Prof. B. W. (U. S. Fish Commission): Eight beetles, 7 specimens of *Anabrus*, and 2 ephemerids from Idaho and Nebraska. 28204. (See under U. S. Fish Commission.)
- FAGAN, T. C. (Washington, D. C.): Langshan hen. 28283.
- FALL, H. C. (Pomona, Cal.): Californian coleoptera, representing 50 species. Exchange. 27171.
- FARNHAM, A. B. (Bennings, D. C.): Great Horned Owl (27230); squirrel and a weasel from the District of Columbia (27567).
- FAULKNER, Mrs. CHARLES J. (Martinsburg, W. Va.): Six-dollar Continental note, printed in Philadelphia in 1775. 28280.
- FEA, LEONARDO (Museo Civico di Storia Naturale, Genoa, Italy): Fishes collected in Burmah. Purchase. 27428.
- FELLOWS, G. S. (See under New Pedrara Onyx Company's exhibit to the World's Columbian Exposition.)
- FERRARI-PEREZ, F. (See under Mexican Commission to the World's Columbian Exposition.)
- FINCH & RICE (Clear Creek, Utah): Pink alabaster. 27496.
- FINSCH, DR. OTTO (Delmenhorst, Germany): Shell money, 6 photographs of natives of Oceanica, and color sketches showing the manner of tattooing. 27204.

FISH COMMISSION, U. S., Col. Marshall McDonald, Commissioner: Sting-ray, *Trygon centrura*, collected by Mr. J. W. Thompson, of Chrispin, Md. (27212); alcoholic specimen of turtle (*Chrysemys marginata*), collected in Indiana by Prof. P. H. Kirsch in 1892 (27298); 10 alcoholic specimens of Tilefish, *Lopholatilus chamaeleonticeps*, G. & B., obtained by the schooner *Grampus* (27320); collection of stomatopod crustaceans obtained principally by the *Albatross*¹ (27505); skin of porcupine from Portage Bay, Alaska, 4 skins of *Sciurus hudsonius* from Cook's Inlet, 4 skins of *Spermophilus* from Shumagin Islands, 3 skins of *Myodes* from Pribilof Islands, and 10 stones from the stomach of a Sea Lion at Monterey, Cal.; tufa from St. Georges Island, and 2 specimens of coal from Cooks Inlet, Alaska; plants from British Columbia, Popof Island, and Bailey Harbor, mosses from Portage Bay, Bailey Harbor and Galapagos Islands, also pinecones and leaves from Lower California; skeletons of mammals, birds, and fishes from various localities; 10 birds' nests and 87 eggs from Alaska; quartz from Unalaska, 4 pieces of quartz from San Pedro Mountains, Lower California, quartz from Bailey Harbor and also from Adax Island, 280 birds' skins obtained by the *Albatross* in the Pacific Ocean (27720); small collection of reptiles and batrachians obtained by Fish Commission field parties in Ohio and Tennessee (27739); 17 bottles containing Japanese pearl oysters, showing the growth during seven years, presented to the Fish Commission by the Japanese Central Association for the World's Columbian Exposition, through Mr. Kokichi Mikimoto, of Miye-Ken, Japan, and transferred to the National Museum (27756); crustaceans exhibited by the Japanese Government at the World's Columbian Exposition, also fishes and reptiles forming a portion of the Japanese exhibit above mentioned (27757);

FISH COMMISSION, U. S.—continued.
alcoholic specimen of *Columbia transmontana*, Eigenmann, obtained by Judge S. H. Greene, of Portland, Oreg. (27760); volcanic rock from Bogoslof Island, Bering Sea, obtained by the *Albatross* in 1891 (27761); large coral, 2 starfishes, *Oreaster*, and several sponges from the exhibit of the Fish Commission at the World's Columbian Exposition (27779); crustaceans resulting from investigations made by the Fish Commission on the Atlantic and Pacific coasts of the United States (27915); collection of fishes made in Arkansas by Prof. S. E. Meek (27928); reptiles and batrachians collected in Nebraska, South Dakota, and Wyoming in 1893 by a field party under the direction of Prof. B. W. Evermann (27929); mammals collected by the *Albatross* in 1892, turtle from Nikolski, snake from Lake Washington, Washington, 2 frogs from Snoqualmie River, collected by the *Albatross* in 1892 (27930); collection of fishes made by the *Albatross* in Alaska and British Columbia (27938); collection of fishes made by the *Albatross*, principally on the coast of California and in the Gulf of California, together with a few collected in the Lower Colorado River by Prof. C. H. Gilbert (27965);² collection of fishing apparatus, nets, seines, trawls, traps, drying sheds, etc., fishermen's clothing, picture frames, drawings, and photographic enlargements; 18 conch shells from the Bahamas; mounted alligator; collection of vessel and boat models, skin canoes and their accessories, shell of Hawk-bill Turtle, and Hawk-bill Turtle polished and mounted; 2 ornamented shell boxes, ornamented shell baskets and shell star, mirror with shell frame, anchor with shell frame; group of Sea Lions, 2 hair seals; group of Fur Seals, paper casts of young porpoise, bottle-nosed porpoise, constituting a portion of the Fish Commission exhibit at the World's Columbian

¹ These specimens will be reported upon by Dr. R. P. Bigelow in a paper to be published in the Proceedings of the National Museum.

² The entire collection has been identified by Professor Gilbert, and the new species which have been described by him in papers published in Vols. XIII, XIV of the Proceedings of the National Museum.

FISH COMMISSION, U. S.—continued.

- Exposition (28022); 3 fishing boats and 7 cases of fish wax; shells; specimens of Japanese alga; fishing apparatus and fishing products of Japan, constituting a portion of a collection presented by the Imperial Japanese Commission to the U. S. Fish Commission and transferred to the National Museum (28023); 125 fresh-water mollusks obtained by field parties connected with the Fish Commission in the Maumee Basin of northern Ohio (28038); reptiles and batrachians obtained by field parties in the Maumee Basin (28053); fresh-water shells obtained principally from eastern Tennessee and the adjacent region (28059); types and co-types of new species of fresh-water fishes from Columbia River basin; type and 6 co-types of *Catostomus pocatello*, type and 26 co-types of *Cottus perplexus*, type of *Cottus liopomus*, and type and 8 co-types of *Agosia umatilla* (28135); reptiles and batrachians, mollusks, and 2 species of crayfishes, *Potamobius klamathensis* and *Potamobius Gambeli*, from the Columbia River basin, collected by field parties belonging to the Fish Commission (28136); crustaceans obtained principally by the *Albatross* in the North Pacific Ocean (28239).
- FISH, C. F. (Fall River, Mass.): Two photographs of mammals. 28107.
- FISHER, DR. A. K. (See under Department of Agriculture.)
- FISHER, F. D. (Harrisburg, Pa.): One hundred and forty-two archaeological objects, consisting of grooved axes, polished hatchets, and arrow-heads from fields near Harrisburg (27934); 64 stone implements from the same locality (28194).
- FISHER, WILLIAM, J. (Kadiak, Alaska): Jurassic fossil shells, 46 archaeological objects, and ethnological objects from Alaska. Purchase. 27806.
- FITZGERALD, WILLIAM (Lewiston, Ill.): Piece of flesh, showing progress of transformation into adipocere. 27311.
- FLETCHER, Miss ALICE. (See under Henry Willett.)
- FLINN, Miss (Washington, D. C.): Two eggs of Black-headed Paroquet, *Caica melanocephala*. 27605.
- FLINT, H. W. (New Haven, Conn.): Abnormally large eggs of Yellow-billed Cuckoo. 27620.
- FLOYD, C. H. B. (Savannah, Ga.): Collection of Indian pottery, 2 stone implements, and 2 shells from a mound in Franklin County, Fla. Purchase. 27333.
- FOOTE, Dr. A. E. (Philadelphia, Pa.): Specimens of cuprite, barysilite, boelite, carynite, martite, ullmannite, and eudidymite from various localities. Exchange. 28190.
- FOOTE, J. HOWARD (New York City): Copper key bugle. Purchase. 27329.
- FORD, JOHN (Holmes, Pa.): Ten specimens of *Cypraea Gregori*, Ford, from the Indo-Pacific Ocean. 27371.
- FOSTERS FALLS MINING AND MANUFACTURING COMPANY (Fosters Falls, Va.): Pupa of Emperor Moth, *Eacles imperialis*. 28290.
- FOWKE, GERARD (Bureau of Ethnology): Two grooved axes obtained near the mouth of Straight Creek, Ohio. Exchange. 27292.
- FOX, Mrs. GEORGE L. (Washington, D. C.): Six original etchings. 27907.
- FRASER, LEWIS W. (New York City): Two posters. 27600.
- FREY, S. L. (Palatine Bridge, N. Y.): Albino house mouse (27461); 35 chipped implements, 8 water-worn pebbles, 145 fragments of pottery, 8 shells, and animal bones from ancient village sites in Montgomery County, N. Y. (27471).
- FRIEL, J. FRED. (Victoria, Ky.): Stone implement from Victoria. 27736.
- FROGGART, WALTER W. (See under Technological Museum, Sydney, New South Wales.)
- FROST, L. L. (Susanville, Cal.): Three stone pestles, model of a Nokum cradle, arrow-points (gift) (27168); heel bone of a llama and a tooth of a fossil horse (*Equus occidentalis*), also a rare variety of bombycid moth, *Pseudohazis eglanteria*, specimen of wood opal from a depth of nearly 100 feet from the surface on Long Valley Creek, Lassen County (27437).
- GADDIS, JOHN J. (New Washington, Ohio): Notched implement of quartzite from Seneca Lake. 27986.

- GALLAHER, Miss L. B. (U. S. National Museum): Dragon fly, *Epiaschna heros* L. 28186.
- GALLATEN, JAMES N. (New York City): Specimen of Praying-mantis, *Hierodula bioculata* (Nymph), from Egypt. 28029.
- GAUMER, GEORGE F. (Lawtence, Kans.): Eight hundred and twenty-seven birds' skins, representing 80 species, from Yucatan and Cozumel Island. 27418.
- GAY, Mrs. E. J. (Washington, D. C.): Brass standing fat-lamp:—Flemish. 27982.
- GERMAN GOVERNMENT PRINTING OFFICE (Berlin, Germany), through Prof. W. A. Roese: Two hundred and forty-one reproductions, by various photomechanical processes, of woodcuts, engravings, etchings, mezzotints, sketches by Dürer, Rembrandt, and others 27730.
- GILBERT, Prof. CHARLES H. (Leland Stanford Junior University, Palo Alto, Cal.): Two type specimens of *Catostomus rhothacus*, Thoburn, collected by Professor Gilbert in Wolf Creek, Tenn. (27614); reptiles and batrachians (27733); skeleton of grampus, *Grampus Stearnsii* (28066); crustaceans representing 5 species from southern California (28231). (See under Fish Commission U. S., and Leland Stanford Junior University.)
- GILBERT, G. K. (See under Interior Department, U. S. Geological Survey.)
- GILL, Dr. THEODORE (Smithsonian Institution): Family of mice (*Mus musculus*). 28169.
- GODFREY, R. W. (Washington, D. C.): Two feet of a calf, showing extra toes. 28185.
- GOLDING SONS & CO. (Trenton, N. J.): Ground feldspar, cornish stone; flint, massive and ground; quartz, and muffle, with saucers mounted for burning, constituting a portion of the company's exhibit at the World's Columbian Exposition. 27891.
- GOODE, Dr. G. BROWN (Assistant Secretary, U. S. National Museum): Book containing engravings of ships. 27281.
- GORRIE, R. H. (Newburg, N. Y.): Watch. Deposit. 27564.
- GOVERNMENT OF THE UNITED STATES OF COLOMBIA, through Mr. Julio Renfigo, secretary of the Colombian legation, Washington: Two silver and 2 bronze medals in commemoration of the fourth centenary of the discovery of America. 27293.
- GOWARD, GUSTAVUS. (See under Shima Sekka.)
- GRAFVERSFORS GRANITE WORKS (Tinspong, Sweden), through Carl Ekman: Six columns and 2 slabs of Swedish granites selected from the exhibit at the World's Columbian Exposition. 27868.
- GRAY, L. E. (Anthon, Iowa): Forty-seven archæological objects found near Anthon (27981); hammer-stone, muller or rubbing-stone, grooved maul, and fragments of an animal jawbone from the same locality (28154).
- GREGOR, ISAIAH (Jacksonville, Fla.): Pepper-box pistol, manufactured by Messrs. Bacon & Co., of Norwich, Conn. (lent) (27695); shells from the West Indies (gift) (27950); specimens of *Glandina truncata*, Say, with eggs (gift) (28017); 4 species of shells obtained principally from the Indo-Pacific Ocean (gift) (28160); brass griffin candlestick and a primer for a gun (deposit) (28286). (See under J. S. Beach and Alphonso Haworth.)
- GREEN, EDWARD (Washington, D. C.): Hognose snake from Mount Vernon, Va. 27627.
- GREEN, N. C. (St. Louis, Mont.): Ant (*Spharophthalma californica*). 28244.
- GREENE, Judge S. H. (See under Fish Commission U. S.)
- GRIFFITH, J. MILTON (Baltimore, Md.): The Commercial Chronicle and Daily Marylander, December 9, 1829, containing a printed copy of the message of President Andrew Jackson to the Twenty-first Congress, first session. 28068.
- GRISWOLD, A. B., & Co. (New Orleans, La.): Flower bug (*Phymatis crosa*). 27300.
- GROVER, W. E. (Galveston, Tex.): Six eggs (2 sets) and 3 nests of Red-winged Blackbird (28268); nest and 4 eggs of Texan Seaside Sparrow (27729); 4 skins of Texan Seaside Sparrow, *Ammodramus maritimus Sennetti*; also 6 sets of eggs and 6 nests (28118).

- GUATEMALA COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION: Two hundred and eighty-nine birds' skins, representing 143 species, dried plants, and a wooden harp made by the natives of Guatemala (27830); collection of skins and mounted mammals; 5 pairs of deer horns; 2 skeletons of Howling Monkey (27831).
- GUPPY, R. J. L. (Port-of-Spain, Trinidad): Tertiary fossils from the West Indies, including Guppy's types of echinoderms (purchase) (27488); fossils, types of species described by Guppy, from Trinidad and Jamaica (28083).
- GUTEKUNST, F. (Philadelphia, Pa.): Carbon print of metal, made by Wenderoth, of Philadelphia. 27961.
- GUTHRIE, OSSIAN (Chicago, Ill.): Glacial pebbles from Chicago and vicinity, selected from Mr. Guthrie's exhibit at the World's Columbian Exposition. 27886.
- GUYE, F. M. (Seattle, Wash.): Iron ore, coal, clay, and other material. 28308.
- HALDERMAN, Gen. JOHN A. (Washington, D. C.): Gold from French Guiana (27676); collection of autograph letters, army sword, and ethnological objects especially connected with General Halderman's official residence in Siam (27737). Deposit.
- HAMILTON & SPARKS (Roswell, N. Mex.): Gypsum. 28138.
- HAMLIN, HOMER (San Diego, Cal.): Twenty-six fossil shells, representing 17 species, from the Tejon formation of California. 27936.
- HAMMOND, GEORGE F. (Pawlet, Vt.): Red and olive slates and slate flour. 28124.
- HANKS, HENRY G. (San Francisco, Cal.): Two photographs of the new mineral, hanksite (27278); type specimens of hanksite (27499).
- HARDY, ISAAC B. (Santa Barbara, Cal.): Shells, representing 10 species, principally from western North America. 27917.
- HARKER, F. W. (Grand Rapids, Mich.): Two watch keys. Deposit. 27580.
- HARLOW, Lient. C. H., U. S. N.: Two Cholo costumes made by the Aymari Indians, La Paz, Bolivia, South America. Deposit. 27668.
- HARPER, CLIO. (See under Arkansas, State Commission of, to the World's Columbian Exposition.)
- HARRIS, FRANK (La Crescent, Minn.): Twenty-nine eggs (7 sets) of Blue Jay, 5 eggs (1 set) of Brown Thrasher, and 7 eggs (2 sets) of Rose-breasted Grosbeak. 27194.
- HARRIS, GILBERT D. (U. S. National Museum): Eocene fossils, representing 24 species, from Smithville, Bastrop County, Tex., partly types of newly described species named by Mr. Harris. 28014.
- HARRIS GEORGE D. (Smithsonian Institution): Collection of invertebrate fossils (11 species) from the upper carboniferous, 4 miles east southeast of Russellville, Pope County, Ark. 28024.
- HARRIS, GEORGE F. (London, England): European Miocene fossils, representing 231 species. Exchange. 27369.
- HARRIS, THOMAS C. (See under State Museum, Raleigh, N. C.)
- HARRISON, BENJAMIN (Pensacola, Fla.): Shells, crabs, centiped (*Cermatia forceps*), and a carnivorous Water Beetle from Pensacola (27319); Spotted Crab from the Gulf of Mexico, 2 fishes (*Platyglossus bivittatus*), captured by Captain Broadbent (27406); crabs and a holothurian, marine bivalve shells (27439); crab (*Menippe mercenaria*), worm (*Rhynchobolus*), and a hermit-crab, *Pagurus granulatus* (27657); 8 alcoholic specimens of fishes consisting of *Gymnothorax ocellatus*, *Letharchus velifer*, *Serranus*, *Astroscoptes y-græcum*, *Chasmodes bosquianus*, *Seriola zonata* (?), small *Siphostoma* and *Stromateus* (27675). See under J. E. Kauser.)
- HARRISON, MARK E. (Greenfield, Mo.): Flint implements from Greenfield (28275); 3 sandstone implements and 6 stone or flint implements from the same locality (28281).
- HASBROUCK, E. M. (Syracuse, N. Y.): Snake (*Eutania*) from Port Clinton, N. Y. (27174); frog and snake from Syracuse, squirrel (*Sciurus hudsonius*) (27323).
- HASSALL, Dr. ALBERT (Department of Agriculture): Two crows (*Corvus americanus*). 27798.
- HAWORTH, ALPHONSO (Mayport, Fla.), through Mr. Isaiah Greegor: Fragments of pottery from near the mouth

- HAWORTH, ALPHONSO—continued.
of St. Johns River (28193); specimens of *Bulimulus Dormani*, W. G. Binn (28282).
- HAY, W. PERRY (Washington, D. C.): Fifteen Tree-frogs from Mount Vernon, Va. 27379.
- HAZLITT, GEORGE K. (Chicago, Ill.): Twelve photographs of watches. Exchange. 27427.
- HEARD, Hon. AUGUSTINE (U. S. Consul-general, Seoul, Korea): Musical instruments and games from Korea. 27263.¹
- HEDGES, HENRY S. (Douglas, Wash.): Minerals (27203); 4 specimens of opal (27957, 28191).
- HEIDEMAN, O. (Department of Agriculture): Hemiptera, representing 2 rare species, *Metrobates hesperius*, Uhl. and *Stephania picta*, H. Sch. Exchange. 27221.
- HEIKES, VICTOR C. (Golden, Colo.): Crude petroleum and a marble slab, selected from the Colorado exhibit at the World's Columbian Exposition. 27878.
- HEMPHILL, HENRY (San Diego, Cal.): Shells representing 32 species from Florida and the Californian coast. 28145.
- HENDERSON, J. B., Jr. (Washington, D. C.), through C. T. Simpson, U. S. National Museum: Miocene marl from Jamaica, containing about 1,500 land shells (27752); hermit-crabs from France (27956).
- HENSHAW, H. W. (Witch Creek, Cal.): Two humming Birds, 16 lizards, snake, and a field mouse (27175); specimens of *Tivela crassatelloides* and *Purpura patula* from Coronado Beach (27180); 257 birds' eggs, representing 26 species, also 64 birds' nests (27291); reptiles and batrachians from California (27718); specimen of *Goniobasis Draytoni*, Lea (28110). (See under Gen. John Bidwell, Juan Pico, and Smithsonian Institution, Bureau of Ethnology.)
- HENDRICKSON, B. E. (See under Dr. J. Eayre Hendrickson.)
- HENDRICKSON, Dr. J. Eayre (Washington, D. C.): Silk flag (made from dresses) captured at the battle of Newbern, N. C., by Mr. B. E. Hendrickson. 28141.
- HENRY, Miss CARRIE (Washington, D. C.): Photographs relating to astronomical, physical, and anatomical subjects. 27746.
- HENRY, Miss M. A. (Washington, D. C.): Battery of the first electro-magnetic telegraph (27225); Sèvres vase presented to the late Prof. Joseph Henry; electric motor made by Professor Henry, and two decorations of the Order of St. Olaf, conferred on Professor Henry (28052). Deposit.
- HERR, JOHN P. (Fayetteville, Pa.): Collection of arrow-heads. Exchange (returned). 27571.
- HERRING, J. L. (Derry Station, Pa.): Giant Water bug, *Benacus griseus*. 27282.
- HICKEY & SPIEKER COMPANY (Chicago, Ill.): Specimens of Fuller's earth, crude, roasted, and pulverized, obtained from the exhibit of the British Fuller's Earth Company (Woburn Sands, Buckingham, England) at the World's Columbian Exposition. 27873.
- HILL, R. T. (U. S. Geological Survey): Flint nodule from Austin, Tex. 28088.
- HILLS, G. (Hudson, N. Y.): Four photographs of a woodcock on its nest. 27951.
- HINTZE, ALEXANDER (Helsingfors, Russia): Lapland Owl, 6 eggs (1 set) of *Scotiaptex cinerea lapponica*, 5 eggs (1 set) of *Surnia ulula*, 5 eggs (1 set) of *Ampelis garrulus*, 4 eggs (1 set) of *Penicola enucleator*, and 4 eggs (1 set) of *Garrulus infaustus*. 27553.
- HISLOP, JAMES (Washington, D. C.): Wheel bug, *Prionidius cristatus*, L. (27279); through E. E. Howell, fragment of meteorite from Beaver Creek, British Columbia (27344).
- HODGIN, J. N. (Richmond, Ind.): Silurian fossils, consisting of 2 specimens of *Lithostrotion canadense*, 2 slabs containing *Pentamerus oblongus*, 29 slabs containing Cincinnati terrane fossils, principally Bryozoa and Brachiopoda. 28021.
- HOFFMAN, Dr. W. J. (See under Smithsonian Institution, Bureau of Ethnology.)

¹Purchased at the request of the Secretary of the Smithsonian Institution for the National Museum.

- HOLINGER, Hon. A. (See under St. Gothard Railway Company.)
- HOLLAND, W. T. (care of Sergeant-at-Arms, U. S. Senate): Section of a tree, embedded with bullets, cut from a tree on the Chickamauga battle-field by J. A. Mosal. 28182.
- HOLZNER, F. X. (See under Dr. Edgar A. Mearns, and Smithsonian Institution, U. S. National Museum.)
- HOPKINS, H. A. (Lansing, Mich.): Sword carried by Col. Ethan Allen at the capture of Fort Ticonderoga in 1775; also shoulder-strap and plate. Deposit. 27314.
- HOPPING, RALPH (Redstone Park, Kaweah, Cal.): Fifty-six species of coleoptera. 27768.
- HORNADAY, W. T. (Buffalo, N. Y.): Two skeletons of Brown Pelican, skull of a Black Bear, and skull of a raccoon, from Micco, Brevard County, Fla. 28195.
- HOUSTON, JOSEPH (Cumberland House, Saskatchewan, Canada): Five green garnets. 27240.
- HOWARD, L. O. (See under C. F. Baker.)
- HOWELL, A. E. (Socorro, N. Mex.): Grasshopper (*Tropidolophus formosus*, Say). 27577.
- HOWELL, E. E. (Washington, D. C.): Syenite containing pseudoleucites, from Magnet Cove, Arkansas, and 10 ounces of vanadinite, from New Mexico (exchange) (27412); snake (*Python molurus*), in the flesh (gift) (27542); barite, pyromorphite, chrysoprase, and azurite, from various localities (exchange) (27684); 22 rocks and minerals, from various localities (exchange) (27925); python (gift) (28011); meteoric iron, from Cañon Diablo, Arizona (purchase) (28112). (See under James Hislop.)
- HUBBARD, H. G. (Department of Agriculture): Specimens of *Bulimus oblongus*, Muller, from St. Kitts, West Indies (28144); 2 frogs (*Rana arcolata asopus*) (27188); specimens of *Amphibulima (?) patula* and *Pellicula depressa* from water-filled axils of Tillandsia, in the mountainous forests of Montserrat, West Indies (28217); 3 Gopher Frogs (28288).
- HULBERT, H. B. (Zanesville, Ohio): One hundred and twenty-one ethnological objects. Purchase. 27363.
- HUNT, Mrs. WILLIAM (New York City): Black broadcloth vest, trousers and silk cravat worn by President Lincoln as his office suit up to the day of his death (gift to Smithsonian Institution) and transferred to the National Museum); portraits of President Lincoln and of Charles Sumner, painted by Mr. William Hunt (deposited in the Smithsonian Institution and transferred to the National Museum) 27959.
- HUNTER, WILLIAM (Accotink, Va.): Stone implement, found in a soapstone quarry on Connecticut avenue extended, Washington City (27289); medal of the Presidential campaign of Gen. W. H. H. Harrison, found in excavation in the National Zoological Park (27290).
- HURTER, JULIUS (St. Louis, Mo.): Six reptiles and batrachians, from various localities. Exchange. 27420.
- HYATT, Prof. ALEXANDER (Boston, Mass.): Cast of *Eurystomites Kellogi*. Purchase. 28245.
- ILLINOIS STATE COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION: Fifty quartz geodes, obtained from near Alton, Madison County, Ill., and constituting a portion of the Illinois exhibit at the World's Columbian Exposition. 27894.
- IMPERIAL GEOLOGICAL SURVEY OF JAPAN (through Imperial Japanese Commission to World's Columbian Exposition): Ores, rocks, metallurgical products, geological maps, series of photographs, soils, coals, and minerals, obtained from the exhibit of the Survey at the World's Columbian Exposition. 27855.
- IMPERIAL JAPANESE COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION: Mounted birds and fowls, also hunting and fishing scenes, pictures of horses, ox cart and other objects (27836); through N. Yamatoka, tablet showing the method of publishing the stenographic report of the Imperial Diet (Congress) of Japan (27838); plans and drawings of the Central Prison, Tokyo (27846); collection of seismographic instruments, earthquake model and show cases for the same, safety lamps, 24 photographs and frames and pictures of old Chause seismometer, and 2 framed

IMPERIAL JAPANESE COMMISSION TO THE
WORLD'S COLUMBIAN EXPOSITION—
continued.

cards (27856), all obtained from the exhibit of Japan at the World's Columbian Exposition. (See under Fish Commission, U. S., and Imperial Geological Survey of Japan.)

INGRAHAM, D. P. (Pueblo, Colo.): Fifty-five birds' skins, representing 5 species, from the Bahamas and Cuba. Deposit. 28126.

INTERCONTINENTAL RAILWAY COMMISSION, through Department of State: Pure sulphur, dry and alcoholic insects, reptiles, seed-pod and seeds, collected by Dr. W. C. Shannon, U. S. A., in Guatemala (27294); through Department of State and Lieut. R. M. G. Brown, U. S. A., relief map of the southern United States, Central and South America, showing railway and steamship routes; also a map of the same region (27859).

INTERNATIONAL BOUNDARY COMMISSION. (See under Dr. Edgar A. Mearns, U. S. A., and F. X. Holzner.)

INTERIOR DEPARTMENT (U. S. Geological Survey, Maj. J. W. Powell, Director): Fragments of bones of *Elephas*, coyotes or Indian dogs, and deer, collected by Mr. H. W. Turner in California (27195); fossil bones from the Chesapeake formation of Nomini Bluffs, Westmoreland County, Va., collected by Mr. N. H. Darton (27579); 100 specimens of minerals from Peacock Mine, Seven Devils district, Idaho, collected by Dr. W. H. Melville (27587); 58 specimens of topaz, tourmaline, epidote, zircon, beryl, and other minerals from various localities, constituting a portion of the Leidy collection (27615); 6 specimens of chabazite from Pike's Peak district, Colorado, collected by Mr. Whitman Cross (27632); miscellaneous minerals belonging to the collection of Joseph Leidy (27658); 500 specimens of galena, sphalerite, calcite, dolomite, and associated minerals from southwestern Missouri, collected by Dr. W. P. Jenney (27659); 18 specimens of native gold, silver, copper, and other elements from various localities (27703); 36 specimens of pyrite, chalcopyrite,

INTERIOR DEPARTMENT—continued.

galena, and other sulphides from various localities (27704); microcline from Pikes Peak, Colorado (27705); 79 specimens of sulphides and 3 silicates from various localities (27706); 3 specimens of cassiterite from Gertie Mine, Hill City, S. Dak., collected by Mr. Wirt Tassin (27707); 12 specimens of haloids from various localities (27712); 200 specimens of quartz, rutile, corundum, brookite, cassiterite, and other oxides from various localities (27713); specimen of adularia, 5 specimens of calcite, 1 of zircon, and 1 of gypsum from various localities (27719); 204 minerals, consisting of garnet, mica, feldspar, staurolite, calamine, beryl, and other silicates from various localities (27734); 108 specimens of apatite, zircon, vesuvianite, fluorite, calcite, stilbite, heulandite, scorodite, torbernite, analcite, opal, wulfenite, vanadinite, and other minerals from various localities (27745); flint from Sitka, Alaska, and 25 specimens of almandite from Stikine River, Alaska; specimen of gold in galena from Silver Bow, Mont., collected by Lieut. G. T. Emmons, U. S. N. (27759); 372 specimens of fluorite, succinite, tourmaline, rhodochrosite, danalite, fergusonite, azurite, apatite, libethenite, anglesite, erochantite, and other minerals from various localities (27772); 116 specimens of calcite, azurite, malachite, serpentine, nephelite, genthite, pyrophyllite, talc, chrysotile, and other minerals from various localities (27780); 96 specimens of beryl, tourmaline, dysanallyte, spinel, opal, pollucite, cesium beryl, leucite, and other minerals from various localities (27781); 20 specimens of aegerite, with manganopectolite, from Magnet Cove, Arkansas, collected by Mr. W. J. Kimzey (27797); gold and silver ores and coal, from Alaska; 2 boats from Alaska (1 a large war canoe, with native decorations, and the other a medium-sized dugout, painted black), obtained by Lieut. G. T. Emmons, U. S. N.; 2 Starfishes, 2 Sea urchins, and 3 crabs, shells, 5 stuffed fishes, consisting of *Hippoglossus vulgaris*, *Ictolepis virgatus*, and *Sebastichthys* (2 species); 6 drawings of extinct animals, made under the direction of Professor Marsh

INTERIOR DEPARTMENT—continued.

- (constituting a portion of the Interior Department exhibit at the World's Columbian Exposition and transferred to the National Museum) (27833); 21 specimens of warrenite and freiselebenite from Garfield (King Cole) Mine, Cascade Mountain, Poverty Gulch, Gunnison County, Colo., collected by Messrs. Whitman Cross and Smith (27904); gold and pyrite in albite from Shaw Mine, Edwards County, Cal., from Mr. Leo Von Rosenbergh, collected by Mr. H. W. Turner (27912); 25 specimens of calcite from 18 miles south of Pueblo, Colo., calcite from 20 miles west of Pueblo and from 4 miles south of Carlisle Spring, Arkansas River, Colorado; 5 specimens of gypsum from Rock Cañon, Arkansas River, 8 miles west of Pueblo, Colo., collected by Mr. G. K. Gilbert (27913); 460 rocks from Silver Cliff district and 114 specimens of rock from the Denver district, collected by Messrs. S. F. Emmons and Whitman Cross (27946); original collection of rocks from the Henry Mountains, made by G. K. Gilbert (27947); 2 cones, 3 flakes, 2 spearheads, and a scraper of obsidian from Mexico, also a stone adz (basalt) from New Zealand (constituting a portion of the Joseph Leidy collection) (27976); lepidolite from Maine (28171); Dr. David T. Day, 12 specimens of minerals (27591, 27923, 27942, 28040, 28113, 28276).
- IOWA MASONIC LIBRARY (Cedar Rapids, Iowa): Medal of the library. 27715.
- ISTITUTO FISICO-GEOGRÁFICO (National Museum of Costa Rica, San José), through W. Pettier: First series of Costa Rican plants. 27392.
- JACK, ROBERT L. (Geological Survey of Queensland, Queensland, Australia): Auriferous siliceous sinter from Mount Morga, Queensland. 27586.
- JACOBS, J. C. A. (Chicago, Ill.): Copper coin of the Dutch East Indies, dated 1754. 27735.
- JAPANESE CENTRAL ASSOCIATION TO THE WORLD'S COLUMBIAN EXPOSITION: Musical instrument, purchased from the exhibit of Japan at the World's Columbian Exposition. 27850. (See under Dr. K. Takayama and Zunhachi Kasai.)
- JENNINGS, FOSTER (Washington, D. C.): Paintings on pith paper illustrating the rice industry in China. Exchange, 27274.
- JENNY, Dr. W. P. (See under Interior Department, U. S. Geological Survey.)
- JERVIS, G. (Turin, Italy): One hundred structural and decorative stones from Italy. Purchase. 27497.
- JEWETT, H. M. (See under Eugene Rodigas.)
- JOBE, W. L. (Columbus, Miss.): Watch. Deposit. 27593.
- JOHNSON, Prof. CHARLES W. (Wagner Free Institute of Science, Philadelphia, Pa.): Threespecimens of *Fulgur eliacians* from St. Augustine, Fla. 28201.
- JOHNSON, M. M. (Oasis, Utah): Topaz crystals (27366); magnetite crystal (28102).
- JOHNSON, Dr. W. C. (Micanopy, Fla.): Lizard (*Ophisaurus ventralis*). 27398.
- JOHNSON ASBESTOS MINING COMPANY, through W. Mackintosh, Thetford, Quebec, Canada: Two blocks of massive serpentine, with veins of asbestos, selected from the company's exhibit at the World's Columbian Exposition. 27887.
- JOHORE COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION: Two specimens of gum copal from Johore and Java; ethnological objects; 4 embryo tigers (*Felis tigris*) in alcohol; section of sago palm tree, 4 samples of sago in various stages of preparation, sago hatchet, samples of gutta-percha, and other objects; large mass of gum copal, and gold, silver, lead, zinc, antimony and tin ores, and corundum; bamboo stringed instrument, 2 bamboo jewsharps, Malay "moon guitar," bamboo flageolet, 3 bamboo whistles, and a wooden gong, obtained by purchase from the exhibit of Johore and Java at the World's Columbian Exposition. 27841.
- JOHORE, Sultan of, through Mr. Rounsevelle Wildman: Ten models of agricultural implements, dominoes, lamps, 2 mortar boxes and tools, fish-house, 3 models of houses, a boat, and 31 boat models, 5 fish-spears, 20 fish-traps and boat implements, obtained by purchase from the Johore exhibit at the World's Columbian Exposition. 28901.

- JONES, DR. JOHN D. (Washington, D. C.): Collection of porcelain and faience, consisting of specimens of Royal Meissen, Royal Saxon, Dresden, Nancy, Vienna, Old Sèvres, Cantigalli, Novi, Bourg la Reine, Capi di Monte, also several figures made of ivory and wood and some rare specimens of Bohemian glass. Deposit. (Returned.) 28060.
- JONES, MRS. L. NOBLE (Washington, D. C.): Copies of oil paintings of Judith (Ch. Allori), Cleopatra (Guido), and Cupid, 2 small landscapes, small sea piece, and 5 Sicilian photographs. Deposit. 27515.
- JOUY, MRS. M. A. (Washington, D. C.): Alcoholic collection of reptiles; specimens of *Limnaea*; crustaceans; insects; chipmunk, 3 mice, and fishes, collected by the late P. L. Jouy in Korea. Purchase. 28032.
- JOUY, P. L. (deceased) (U. S. National Museum): Pottery made in San Antonio (Cuernavaca), State of Morelos, Mexico, and peculiar to that country (gift) (27503); reptiles and batrachians (purchase) (27823). (See under Mrs. M. A. Jouy.)
- JUDD, ELMER T. (Cando, N. Dak.): Ten eggs of Chestnut-collared Longspur, and 2 eggs of cowbird. 28007.
- KALB, DR. C. W. (Spokane Falls, Wash.), through F. A. Lucas: Three specimens of *Anabrus purpuratus*, Uhl., from Washington. 27257.
- KASAI, ZUNHACHI (Yamaguchiken, Japan), through Japanese Central Association to World's Columbian Exposition: White marble slab obtained from the exhibit of Japan at the World's Columbian Exposition. 27853.
- KAUSER, J. E. (Pensacola, Fla.), through J. E. Benedict: Salt-water fishes, lady-crabs, and a portion of a large *Arenicola* (27229); through Judge Benjamin Harrison, crabs, specimen of *Loligo Pealei*, Verrill, and fishes (27234.)
- KAYSER, WILLIAM (Wapakoneta, Ohio): Forty-four species of insects (27217); 23 species of insects (27368); 50 species of insects of various orders from Ohio and Washington (28237.)
- KEEN, Rev. J. H. (See under Dr. John Macoun.)
- KEITH, J. G. (No address given.) Stalactitic mass from Mammoth Crystal Cave, Black Hills, S. Dak., selected from Mr. Keith's exhibit to World's Columbian Exposition. 27889.
- KELLOGG, G. F. (foreman of Lexington Mine, Deer Lodge, Mont.), through Prof. F. W. Traphagan, College of Montana: Tin pail encrusted with selenite crystals, taken from Lexington Mine, Butte, Mont., selected from the exhibit of the College of Montana to the World's Columbian Exposition. 27865.
- KELLY, RICHARD A. (Webster City, Iowa): Piece of Illinois third vein coal, with depressions resembling human footprints. 27152.
- KEMPTON, C. W. (Oro Blanco, Ariz.): Desert Cricket, *Stenopelmatus talpa*, Burm. 27650.
- KENNEDY, J. M. (Bedford, Mo.): Doubled-crested Cormorant. 28129.
- KERR, MARK B. (Tumaco, Colombia, South America): Bat (*Tylostoma crenulatum*), 2 alcoholic specimens of Mailed Catfish (*Plecostomus*) and alcoholic reptiles (28150); 2 centipeds and spiders; specimen of *Cycelotus popeianus* (?); pressed plants, sample of the bark of 2 different trees, "Taniajahua" and "Sandy," also a sample of milk of the latter; alcoholic reptiles from Santiago River, Angostura, Plaza de Oro and Plaza Rica; skins of wood rat and field mouse, in alcohol, from Santiago River, common mouse, and two alcoholic bats, *Vespertilio nigricans*, from Plaza de Oro, Santiago River, Ecuador, and sample of Tamax agare cloth from Ecuador (27247).
- KESSELER, J. and F. (San Francisco, Cal.): Onyx marbles from the quarries at San Luis Obispo. 27544.
- KEYES, CHARLES R. (Mount Vernon, Iowa): Thirteen eggs (6 sets) of Red-tailed Hawk, 3 eggs (1 set) of Cooper's Hawk, 2 eggs (1 set) of Barred Owl, 2 eggs (1 set) of Great Horned Owl (27362); eggs of Red-tailed Hawk (28044). Exchange.
- KIMLER, JOSEPH F. (Williamsport, Md.): Larva of Abbott's Sphinx, *Thyreus Abbottii*. 27183.
- KIMZEY, W. J. (See under Interior Department, U. S. Geological Survey.)

- KING, C. L. (Springfield, Mo.): Specimens of Seventeen-year Locust, *Cicada septendecim*, L. 28196.
- KING, JESSE (Norristown, Pa.): Quartz crystals. 27597.
- KING, JOHN A. (Great Neck, Long Island, New York): Autotype portrait of Rufus King, from a painting by Gilbert Stuart. 27778.
- KINGAN, A. B. (Staunton, Va.): Fragments of leaves of the Plane Tree (*Platanus*.) 28147.
- KIRKER, Miss A. J. (Portland, Oreg.): Twenty archæological objects, consisting of buttons and other articles; also a human skull found on the banks of the Clackamas River, Oregon. 27468.
- KIRSCH, Prof. P. H. (See under Fish Commission, U. S.)
- KNAUS, LUDWIG. (See under S. P. Avery.)
- KNOWLTON, F. H. (U. S. National Museum): Mole cricket, *Gryllotalpa borealis*, from Laurel, Md. (27251); King Snake, from the same locality (27318).
- KOHN, GUSTAVE (New Orleans, La.): Mud turtles, *Kinosternon louisianæ* (exchange) (28067); two type specimens (male and female) of *Pseudemys alabamensis* (deposit) (27639).
- KOREAN COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION: Lacquered chest, quiver case, and two screens; model of a Korean worship house; Korean carrying chair (obtained by purchase from the exhibit of Korea at the World's Columbian Exposition) (27828); two inlaid cabinets, inlaid bamboo-work cabinet, complete suit of court dress, with hat and belt, hatbox, trunk, bed, and 2 mats; wooden bowl for placer gold washing, and 4 mammal skins (obtained from the Korean exhibit) (27829).
- KRAENTER, J. W. (Newark, N. J.): Isabella Pigmy Pouter Pigeons (27337, 27478).
- KRAEMER, CHARLES F. (Baltimore, Md.): Two silver watches. Deposit. 27520.
- KRÜSI, GRAF (Gais, Switzerland): Butterfly net. Purchase. 27249.
- KUEHLING, J. H. (Washington, D. C.): Screech Owl, *Megascops asio*, in the flesh, from Mount Vernon, Va. 28146.
- KUNZ, GEORGE F. (New York City): One hundred and fifty-seven souvenir and historical medals relating to the World's Columbian Exposition. 28081.
- KWANSEI GAKUNI MISSION INSTITUTE (Biblical department) (Kobé, Japan), through Rev. J. Calhoun Newton: Collection of photographs, documents, models, figures, etc., relating to religion and the religious history of Buddhism and Christianity in Japan. Exchange. 28096.
- LACOE, R. D. (Pittston, Pa.): Carboniferous plants, constituting the fourth installment of the Lacoe collection. 27169.
- LAMBSON, GILES H. (Washington, D. C.): Large crayfish from Monterey, Cal. 27236.
- LANE, MERT (Waynesville, Mo.): Two cocoons of Bag Worm, *Thyridopteryx ephemeriformis* (27287); specimens of *Conocephalus conicus* and *Camptosurus rhizophyllus*, moss, lichens, and a poly-porinous fungus (27741).
- LANGDALE, J. W. (Washington, D. C.), through G. P. Merrill: Gypsum from St. Mary County, Md. (gift) (27199); analcite (exchange) (27326); 25 minerals from various localities (exchange) (27466); ores of lead and copper from Glen Echo, Md. (exchange) (27588); amarantite from Caracoles, Sierra Gordo, Chile, and chabazite from County Antrim, Ireland (gift) (27911); mesolite, variety antrimolite, gismondite, with amphibole and meionite, from County Antrim, Ireland, and Mount Somma, Italy (gift) (27979); actinolite in calcite, from Washington, D. C. (gift) (27994).
- LANSINGER, WILLIAM H. (Littleton, Pa.): Five specimens of lepidoptera. 27413.
- LASSIMONNE, Prof. S. E. (Yseure, Allier, France): Plants. Exchange. 27689.
- LATTIN, F. H., & Co. (Albion, N. Y.): Eleven eggs (1set) of Hooded Merganser from Michigan. Purchase. 28259.
- LAWRENCE, JOHN P. (Bristol, Pa.): Ribbon badge of National Workingmen's Protective League, Washington, April 20-21, 1894. 28086.
- LAWRENCE, G. N. (See under J. G. Wells).
- LAWRENCE, R. H. (Monrovia, Cal.), through Maj. Charles Bendire, U. S. A.: Skin of California Poor-will, *Phalacroptilus Nuttalli californicus*, from California, and skin of *Spinus pinus* from Wash-

- LAWRENCE, R. H.—continued.
 ington (27193); set of eggs of California Poor-will (new to the collection), 3 eggs and 2 nests of Arizona Hooded Oriole (27223).
- LAWSON, Dr. ANDREW C. (Berkeley, Cal.): Three specimens of carmeloite containing iddingsite. Exchange. 27666.
- LEADHOLM, A. H. (Pilot Mound, Iowa): Polished stone ball. Exchange. 27969.
- LECHE, Prof. WILHELM (Stockholm, Sweden): Six mammal skins and 2 skeletons of mammals from Sweden. 27330.
- LEE, THOMAS (Westport, N. Y.): Skin of Arctic Three-toed Woodpecker, *Picoides arcticus*. 27663.
- LEE, WILLIAM P. (New York City): White sand from Virginia. 28214.
- LE GHAI, Hon. A. (See under Commercial Museum, Belgium.)
- LEIDY, Dr. (See under Interior Department, U. S. Geological Survey.)
- LELAND STANFORD JUNIOR UNIVERSITY (Palo Alto, Cal.), through Prof. C. H. Gilbert: Lizard (*Verticaria Beldingi*). Exchange. 28116.
- LEMBERT, JOHN B. (Yo Semite, Cal.): Insects (returned), string of beads obtained from an old cremation ground of the Yo Semite Indians, also an arrow-head. 28036.
- LEMON, Dr. JOHN H. (New Albany, Ind.): Nests of caterpillar (*Datana*), taken from a walnut tree. 27538.
- LENTZ, WILLIAM S. (Allentown, Pa.): White Owl Pigeon. 27559.
- LERCH, J. (New York City): Watch. Deposit. 27531.
- LEVY, ROBERT J. (World's Columbian Exposition): Egyptian religious flag, Mecca flag, prayer rug, Koran stand, and a dervish basket (purchase) (27205); 4 window screens, 3 chairs or stools, 2 carved wooden panels, 2 carrying trays, 2 donkey saddles, 10 mosque inscriptions (in gilt frames), 3 mosque candles and 2 pairs of mosque sandals, mosque lamp (selected from Mr. Levy's exhibit at the World's Columbian Exposition) (27840); wooden model of an obelisk with base, and a model of a serpentine column at Constantinople, Turkey (selected from the exhibit of Mr. Levy at the World's Columbian Exposition) (27849).
- LEWIS, GEORGE A. (Wickford, R. I.): Sea Catfish, or Gaff-topsail Catfish, *Aillichthys marinus* (27286); 2 specimens of *Achirus* and egg-cases of *Raia*, Cootor Water Hen, *Fulica americana* (27373); Lady-fish, *Albula vulpes* (27391); 11 specimens of Winter Flounder, *Pseudopleuronectes americanus* (27546); Brunnich's Murre, *Lonvia arra* (27743); 2 specimens (male and female) of American Eider, *Somateria dresseri*, in the flesh (28092).
- LINCOLN, J. M. (New York City): Teeth of fossil sharks. 27651.
- LITTLEJOHN, CHASE (Redwood City, Cal.): Two eggs of Nelson's Ptarmigan from Unalaska, Alaska (27683); through Maj. Charles Bendire, U. S. A., 3 specimens of Lincoln's Sparrow, *Melospiza Lincolni* (27800).
- LOEBER, CHARLES L. (New York City): Two negatives. Purchase. 27459.
- LOEFFLER, J., Jr. (Baltimore, Md.): Rabbit, in the flesh. 28174.
- LÖNNBERG, Dr. EINAR (Upsala, Sweden): Reptiles from Florida (27669); specimens of *Zygonecetes craticula*, *Zygonecetes Henshallii*, *Zygonecetes chrysolus*, and *Fundulus heteroclitus*, also reptiles from Florida (27731); 3 salamanders from Savannah, Ga. (28103); snake (*Helicops Alleni*) from Florida (28307).
- LOOMIS, Rev. HENRY (Yokohama, Japan): Shells (27932); 2 crabs, a hydractinian, and shells from Japan (28148).
- LOUCKS, W. E. (Peoria, Ill.): Forty eggs (8 sets) of Prothonotary Warbler and egg of Cowbird (27272); nest of Prothonotary Warbler (27376).
- LOWREY, Col. W. L. (Asheville, N. C.): Spinel associated with biotite (27176); ores (27258); ilmenite crystals (27380); nickel, chrome ore, and rutile (27557).
- LUCAS, F. A. (See under Dr. C. W. Kalb.)
- LUCAS, Dr. H. S. (Acworth, Ga.), through Prof. F. W. Clarke: Corundum. 27397.
- LUNDGREN, BERNARD (Lund, Sweden), through Hon. Charles D. Walcott: Thirty-three specimens of *Olenellus Lundgreni*, 4 specimens of *Olenellus torelli*, 9 plaster casts of *Olenellus torelli*, 4 plaster casts of *Olenellus Lundgreni*, specimen of *Obolella* sp. undetermined, and 3 specimens of *Hyalithes* sp. undetermined. 28189.

- LYLE, A. I. (Malinda, Ga.): Three specimens of mineral, arrow-head, and fragment of an Indian pipe found near Malinda. 27411.
- MCCARTHY, GERALD (Raleigh, N. C.): Isopod. 27582.
- MCCLINTOCK, F. C. (Phoenix, Ariz.): Grant's Rhinoceros Beetle, *Dynastes Grantii*, Horn. 28117.
- MCDONALD, ANGUS (Washington, D. C.): Confederate envelope with cut of a flag, 8 stamped envelopes of the issue of 1853 to 1855, 6 colored photographs of natives of Hamburg. 27561.
- MCDONALD, A. F. (Wind Cave, S. Dak.): Stalactite calcite, selected from the exhibit of Mr. McDonald at the World's Columbian Exposition. 27875.
- McFADIN, SAMUEL L. (Logansport, Ind.): Skull of *Castoroides ohioensis*. 28122.
- MCGLINCY, R. P. (See under Santa Clara County exhibit to World's Columbian Exposition.)
- MCGUIRE, Dr. J. C. (Washington, D. C.): Stalagmite marble from Virginia. 27611.
- MCLHENNY, E. A. (Avery, La.): Ten eggs (2 sets) of Snowy Heron, 7 eggs (2 sets) of Reddish Egret, 10 eggs (2 sets) of Louisiana Heron, 10 eggs (3 sets) of Little Blue Heron, 15 eggs (3 sets) of Green Heron, and 2 eggs (1 set) of Mississippi Kite (27198); through Maj. Charles Bendire, U. S. A., skin of oriole, *Icterus gularis* from Averys Island (new to the fauna of the United States) (27364); 4 birds' skins from Sand Island, Louisiana (28233).
- MCKINNEY, R. C. (U. S. Geological Survey): Indian skull taken from a grave on a branch of Powder River, Wyoming. (Deposited in Army Medical Museum.) 27507.
- McMURTRIE, Dr. WILLIAM (Brooklyn, N. Y.): Two thousand samples of wool and other animal fibers from various parts of the world (27656); series of samples showing the method of utilizing the fur of the Orenburg goat (28153).
- MACDONALD, GEORGE H. (Washington, D. C.): Turkish knife. 28285.
- MACKINTOSH, W. (Buckingham, Quebec, Canada): Asbestos, apatite, mica, lead, zinc, iron and copper ores, selected from Mr. Mackintosh's exhibit at the World's Columbian Exposition. 27888.
- MACKINTOSH, W. (See under Johnson Asbestos Mining Company.)
- MADELL, ALEXANDER. (See under E. E. Dean.)
- MACOMBER, JAMES N. (Wrightsville, N. C.): Larva of Imperial Moth, *Eacles imperialis*. 27455.
- MACOUN, Dr. JOHN (Canadian geological survey, Ottawa, Canada): Four specimens of *Aulorhynchus flavidus*, and 2 very young salmon (*Oncorhynchus*) collected by Rev. J. H. Keen in British Columbia (27901); reptiles, specimens of *Ammodytes*, *Citharichthys*, *Gobiesox*, *Xiphister*, *Anoplarchus*, *Muranoides*, *Ascelichthys*, 2 very young specimens of Cottoids, and a young Embiotocoid (?) (28097).
- MARCOU, JULES (Cambridge, Mass.): Fossil wood, from near Epsom Spring, in the vicinity of Canadian River, west of Indian Territory. 27233.
- MARKSON, PHILIP A. (Salubria, Idaho): Lead ores from Keystone mine, Washington County, Idaho. 27173.
- MARMADUKE, J. E. (Stratford, Va.): Cotton-tail Rabbit, *Lepus sylvaticus* (semi-albino). 27599.
- MARQUAND, H. G. (See under Washington Memorial Arch Committee.)
- MARSH, Prof. O. C. (Yale College, New Haven, Conn.): Seventeen plates of engravings of vertebrate fossils, and 6 copies of Geological Horizon of Vertebrate Fossils. 28293. (See under Interior Department, U. S. Geological Survey.)
- MARSHALL, GEORGE (Smithsonian Institution): Salamander (*Diemictylus*), from Laurel, Md. (27299); squirrel (*Sciurus hudsonius*) (27511).
- MARSHALL, HENRY (U. S. National Museum): Pine-mouse, *Arvicola pinetorum*. 27308.
- MARSHALL, W. P. (Punta Gorda, Fla.): Nest of *Cremastogaster*. 28132.
- MARX, Dr. GEORGE (Department of Agriculture): Fifteen species of ticks, including 6 type specimens. 27640. (See under Dr. George Baur.)
- MASON, H. D., & SONS (East Chatham, N. Y.): Two Wyandotte Hens. 27935.
- MATTHEWS, Dr. W., U. S. A.: Sacred basket, drum, and yucca stick. 28071.

- MAXWELL, J. A. (Joliet, Ill.): Natural stones, stones rudely worked, and arrow-heads found near Joliet. Exchange. 27228.
- MAZZA, CHARLES N. (New York City): Fine-grained argillaceous rock, and a sample of the powder made from it. 27410.
- MEAD, CHARLES H. (Trenton, N. J.): Belemnites, representing the species *Belemnitella mucronata*, Schlotheim, also papers and a map relating to the Indian mounds in Middlesex County, N. J. 27750.
- MEARNS, DR. EDGAR A., U. S. A. (International Boundary Commission, La Noria, Ariz.): Mammal skins and skulls, also alcoholic mammals and birds' skins from Fort Hancock, Tex. (deposit) (27213); insects, alcoholic reptiles, 121 birds' eggs, representing 50 species, also 22 nests, from Forts Clark and Hancock, and the International Boundary Survey between the United States and Mexico (gift) (27216); arrow-points from Emory's fourth monument, 55 miles west of El Paso; alcoholic reptiles from Fort Clark, Tex., soft-shelled and box turtle, from Fort Hancock, birds' skins, alcoholic specimens of fishes from Fort Clark, consisting of *Anguilla*, *Ictalurus*, *Lepidosteus*, *Moxostoma*, *Dorosoma*, *Tetragonopterus*, *Etheostoma*, *Lepomis*, *Micropterus*, *Heros*, *Notropis*, and *Gambusia*, land and fresh-water shells, alcoholic and dry crayfishes and a shrimp from Fort Clark, Tex., and Minnesota River, Minnesota, mammal skins, skulls, and bats, birds' nests and eggs from Fort Clark, fragments of pottery from Emory's fourth monument, and 3 insects from Fort Clark (deposit) (27250); collection of mammal skins and skulls and a bulb from Fort Huachuca (27400); (Tucson, Ariz.) collection of coniferae, fresh-water shells, principally *Anodonta*, rocks (27444); collection of mammal skins, skulls, and bones collected principally by Mr. F. X. Holzner, 2 fossils shells, from near Mexican boundary line, Arizona; rocks from a ruined village near Dutch Charley's, Arizona; fragments of pottery from the same locality, 440 birds' skins, representing 110 species, from the boundary line of the United States
- MEARNS, DR. EDGAR A., U. S. A.—cont'd. and Mexico (27494); collection of mammal skins, land and fresh-water shells from Arizona and Mexican boundary region, birds' skins (27598); birds' skins, pine-cones and other botanical specimens, shells, mammal skins and skulls, birds' eggs, rocks (27612); fossil shells, containing specimens of *Inoceramus labiatus*, Scloth. from the Upper Cretaceous, and a pebble containing specimens of *Exogyra arietina*, Roemer, from the Washita division of the Lower Cretaceous; specimen of wood, several species of fishes belonging to the genera *Gambusia*, *Squalius*, *Notropis*, and *Catostomus*; botanical specimens, alcoholic birds, mammals and mammal skins and skulls, birds' eggs, alcoholic reptiles, beetles and other insects, birds' skins (27625); Peccary, *Dicotyles tajacu* (27677); pocket rat, *Thomomys*, and 3 specimens of *Spermophilus* (27709); 73 birds' skins, representing 26 species, from the United States and Mexican boundary line (27711); (Buenos Ayres, Ariz.) birds' skins, red berries, mammal skins and skulls, rocks, fragments of fossil bones (27742); (Yuma, Ariz.) pottery, ores, birds' skins, arrow-head, shell, plants, mammal skins and skulls from Mexico (27749); birds' skins, rocks, mammal skins, and skulls (27803); birds' skins, specimens of fossil shells, *Venus* and *Pectunculus*, from Colorado and Arizona, mammal skins, skulls, and horns; rocks (28005); collection of alcoholic mammals, obtained along the Mexican boundary line between Fort Huachuca and Yuma, Ariz.; alcoholic birds, reptiles, etc., and insects from the same locality (28058); reptiles, birds' skins, shells, mammal skins and skulls, and 4 wooden ladles made by the Papago Indians of Sonora, Mexico (28077); scorpion and 6 beetles, alcoholic reptiles, fiddler crabs, mammals, alcoholic birds, and specimens of *Xyrauchen*, *Gila*, *Cyprinus carpio*, *Leuciscus*, *Mugil*, and *Cyprinodon* (28133).
- MEEK, Prof. S. E. (Arkansas Industrial University, Fayetteville, Ark.): Three snakes. 28104. (See under Fish Commission, U. S.)
- MEISSNER, J. W. (New York City): Chromocollograph made by Messrs. Meissner & Buch, Leipsic, Germany. 27906,

- MELVILLE, Dr. W. H. (See under Interior Department, U. S. Geological Survey.)
- MENSING, A. (New York City): Three water-worn pebbles (perforated) and a specimen resembling an adze-shaped implement. 27609.
- MERCER, H. C. (Doylestown, Pa.): Hammer stone, worked flakes, and rude chipped implements from Bucks County. 27454.
- MERRIAM, Dr. C. HART. (See under Department of Agriculture; also J. P. Seiter.)
- MERRILL, G. P. (U. S. National Museum): Rocks from Maine (27255); quartz from Scarborough, Cumberland County, Me. (28235). (See under J. W. Langdale.)
- MERRILL, V. D. (Bear Grove, Iowa): Dorsal vertebra and tooth of Bison, *Bison americanus*, partially fossilized. 27624.
- MESSLEIN, M. A. (Farrville, Ind.): Two caterpillars of *Empretia stimulea*, Clem. 27481.
- MEUKE, H. W. (Garden City, Kans.): Skin of Weasel, *Putorius longicauda*. 27304.
- MEXICAN COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION, through F. Ferrari-Perez: Four pottery flageolets and 2 pottery horns, small collection of alcoholic crustaceans, model of suspension bridge, alcoholic reptiles from Mexico, alcoholic fishes and water bug, *Abedus breviceps*, Stal., 6 early copper coins of Mexico obtained from the exhibit of Mexico at the World's Columbian Exposition. 27857.
- MIKIMOTO, KOKICHI. (See under Fish Commission, U. S.)
- MILLER, A. W. (Portland, Oreg.): Re-algar, selected from Mr. Miller's exhibit at the World's Columbian Exposition; also specimens of mercury and nickel ore, clay, ocher, and building stone. 27884.
- MILLER, CHARLES, Jr. (Grand Rapids, Mich.): Specimens of Unio, and 6 fragments of pottery from a small mound near Grand Rapids. 27738.
- MILLER, F. T. (Lehi, Utah): Mineral, specimen of variscite (27688); piece of onyx marble (27725).
- MILLER, GERRIT S., Jr. (Peterboro, N. Y.): Skin and skull of Jumping Mouse,
- MILLER, GERRIT S., Jr.—continued.
Zapus insignis (exchange) (27259); 2 skins and skulls of Jumping Mouse (gift) (27569).
- MILLER, J. E. (Iquique, Peru, South America): Mummified human eye from Peru. 27685.
- MILLER, W. (Grand Rapids, Mich.): Four medals; check of A. C. Gordon & Co. for \$100 on City National Bank of Grand Rapids, 5 stamped envelopes, and 7 foreign stamps. 27565.
- MILLS, ROBERT A. (Chuluota, Fla.): Box of sand containing 11 fragments of bones and teeth from a mound in Orange County (27563); 29 shells and glass beads (27814); 2 Indian hatchets, fragment of the jawbone of a mammal, and 2 pieces of pottery from Orange Mound (27997); arrow-point from a shell mound near St. Johns River (28199).
- MILLS, T. B. (Las Vegas, N. Mex.): Large polished slab of onyx marble from Las Vegas, selected from the exhibit made by Mr. Mills at the World's Columbian Exposition. 27870.
- MILNER, J. B. (U. S. National Museum): Small collection of photographs of natives and costumes, from New Guinea and Australia. 27402.
- MINER, W. H. (Washington, D. C.): Red-breasted Cockatoo, in the flesh. 27673.
- MITCHELL, G. E. and RICHMOND, C. W. (Smithsonian Institution): Reptiles from Nicaragua. 27377.
- MITCHELL, J. D. (Victoria, Tex.): Land and fresh-water shells, representing 14 species (27388); specimens of Helix and Unio, from Texas, representing 7 species (27434); 8 specimens of Unionidæ from Texas (27502); Gnathodon, dry and alcoholic shells, hermit-crab, *Eupagurus longicarpus*, Say, worm and a sponge (27682); 3 specimens of Unio and a Gnathodon with an oyster and specimen of *Mytilus* attached (27751); 2 starfishes (*Luidia clathrata*, Lutkin), Sand dollar, *Mellita testudinata*, Klein, hermit-crab, *Eupagurus floridanus*, Benedict, and shells from the coast of Texas (27918); shells, *Bulimulus Schiedeanus*, Pfr (28119); 10 dried specimens of crabs, starfishes, and sea-urchins (28202); 6 specimens of Unios from Texas (28225); Unios (28266).

- MITCHELL, NASH (Pittsville, Wis.): Watch. Deposit. 27556.
- MITSUKURI, Dr. K. (Science College Imperial University, Tokyo, Japan): Collection of insects, consisting of about 1,500 species, from Japan. 27854.
- MOLYNEUX, E. T. (Webb City, Mo.), through James A. Reeves: Specimen of sphalerite. 27717.
- MOONEY, JAMES. (See under Smithsonian Institution, Bureau of Ethnology.)
- MOORE, JOHN T. (Washington, D. C.): Water-worn concretion from Johnstown, Pa. 27708.
- MORGAN, C. W. (Woodside, Md.): Lubber Grass-hopper, *Dictyophorus picticornis*. 27244.
- MORSE, Prof. A. P. (Wellesley College, Wellesley, Mass.): Four type specimens of *Stenobothrus olivaceus*, Morse (27537); type of 3 species of *Spharagemon* from New England (28211).
- MOSAL, J. A. (See under W. T. Holland.)
- MOSS, WILLIAM (Ashton-under-Lyne, England): Fourteen photographs of molluscan radulae (gift) (27473); 18 mounts and 17 photographs of radulae from various localities (gift) (27916); 6 photographs of molluscan radulae and parts of various species of British Helices (gift) (28152); 6 photomicrographs of sections of Echinus spines (gift) (28183); 10 microscopical slides of fossil plants of the English coal measures and 2 slides of British foraminifera containing 62 species (exchange) (28215).
- MUSEUM OF FINE ARTS (Boston, Mass.): View of Rome, engraving in 3 sheets, by Voplato, after Panini. Exchange. 28037.
- MUSEUM OF NATURAL HISTORY (Paris, France): Eleven reptiles and batrachians from Africa and Asia. Exchange. 27335.
- NACK, CHARLES (Engenheiro, Bahia, Brazil): Rocks. 27306.
- NELSON, E. W. (Department of Agriculture): Six volcanic rocks from Mexico. 27607. (See under Department of Agriculture.)
- NEUMANN, Dr. JULIUS (Westminster, London, England): Chinese silver and cloisonné work from China. Purchase. 27288.
- NEVINS, R. D. (Blaine, Wash.): Larvæ of Syrphid Fly, *Eristalis tenax*. 28298.
- NEWCOMBE, Dr. C. F. (Provincial Museum, Victoria, British Columbia): Collection of shells, principally marine, from Comox, Victoria, and Clioquot Sound, Vancouver Island (27465); shells from British Columbia and Vancouver Island (27667); recent specimens of *Mactra falcata* from Comox and Clioquot Sound, and other fossils from the drift of Lucia Island, Straits of Georgia (28218).
- NEW MEXICAN COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION: Costume and lay figure of a miner, and a stuffed donkey, illustrating the transportation of ore from the mines, obtained from the exhibit of New Mexico at the World's Columbian Exposition. 27842.
- NEW PEDRARA ONYX COMPANY, through Mr. G. S. Fellows (New York City): Two slabs of onyx marbles from Baja, Cal., selected from the company's exhibit at the World's Columbian Exposition. 27871.
- NEW SOUTH WALES COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION, through Prof. F. W. Clarke, U. S. Geological Survey: Specimens of cerussite from Yancoinna, graphite from New England (New South Wales), cassiterite from Capes Creek, scheelite from Cordellera Well, 4 specimens of cewantite from near Gulzory, and 8 specimens of stibnite from Hill Grove (selected from the New South Wales exhibit World's Columbian Exposition) at the (27771); through Mr. Joseph E. Carne, gold, silver, tin, antimony, and manganese ores, ochers, graphite, alunite, alum, kaolin, coal nodules, and other specimens (obtained by exchange) (27864).
- NEWTON, Prof. ALFRED (Magdalene College, Cambridge, England): Eight birds' skins, representing 4 species from Mauritius, Rodriguez, and Anjuan Islands. Exchange. 27807.
- NEWTON, Rev. J. C. CALMOUN. (See under Kwansai Gakuna Mission Institute.)
- NIBLACK, Lieut. A. P., U. S. N.: Collection of Spanish and Moorish weapons. Lent. 28095.

- NICHOLS, Dr. G. L. (New York City): Seventeen birds' skins, representing 17 species, from New Jersey. 27585.
- NICHOLS, CHARLES (Pescadero, Cal.), through Maj. Charles Bendire, U. S. A.: Three specimens of Oregon Junco, *Junco hyemalis oregonus*. 27941.
- NORDENSKJÖLD, A. E. (Stockholm, Sweden), through Royal Swedish Commission to World's Columbian Exposition: Collection of books, maps, globes, and other objects from Mr. Nordenskiöld's exhibit at the World's Columbian Exposition. Returned. 27861.
- NORÖ, K. (Osaka, Japan, superintendent of Association of Osaka Exhibitors to World's Columbian Exposition): Model of ancient Japanese worship barge, and Japanese drum. Purchase. 27834.
- NOTMAN, GEORGE. (See under Copper Queen Consolidated Mining Company.)
- NOYES, HARRY F. (Satilla Bluff, Ga.): Specimen of *Phengodes laticollis*. 28238.
- NUTTALL, Mrs. ZELIA (Dresden, Germany): Wedgwood or Turner sugar basin of black basalt porcelain. 28156. (See under Henry Willett.)
- NYE, WILLARD, Jr. (New Bedford, Mass.): Sketch of a carving from a stone on an old wall which now forms part of the foundation of a barn owned by Mr. G. W. Kempton, of Little Compton, R. I. (27818); skin of American Merganser, *Merganser americanus* (27909); skin of Canvas-back Duck, *Aythya vallisneria* (27940); cluster of tubes of *Serpula dianthus*, from Acushnet River, New Bedford (28008).
- OGDEN, HERBERT. (See under Smithsonian Institution, Bureau of Ethnology.)
- OGDEN, H. G. (See under Treasury Department, U. S. Coast and Geodetic Survey.)
- OLDROYD, T. S. (Los Angeles, Cal.): Fine specimens of *Ricciopsis punctatocelata* and *Cardium quadragenarium*, from San Pedro Bay (27723); 4 specimens of *Cardium quadragenarium* from the same locality (27796); 2 specimens of *Haliotis fulgens* and a specimen of *Helix kelletii*, from Redondo, Catalina Island (27910).
- OLDS, FRED. A. (Raleigh, N. C.): Candle washed from the wreck of the Confederate blockade runner *Beauregard*. 27357.
- OLNEY, Mrs. M. P. (Spokane, Wash.): Alcoholic specimens of Unionidæ from the Pacific Slope (27370); Anodontæ, representing 2 species, from Spokane (27426).
- ORE, W. J. (Mossy Creek, Tenn.): Locust-tree Borer, *Cyllene Robinia*, Forst. 27414.
- ORTH, GEORGE S. (Pittsburg, Pa.): Twenty photographs of ruins in Chaco Cañon, New Mexico. 28041.
- OSAKA ASSOCIATION, OSAKA, JAPAN, TO THE WORLD'S COLUMBIAN EXPOSITION: Musical instrument obtained from the exhibit of the association at the World's Columbian Exposition. 27851.
- OSBORN, HERBERT (Ames, Iowa): Shells from Vera Cruz. 28128.
- OSBURN, WILLIAM (Nashville, Tenn.): Insects. 27927.
- OWEN, Sir RICHARD: Manuscript of part of a paper on the comparative anatomy of the invertebrata, commencing "Male organs of batrachians," written in his own handwriting and transmitted by his family, through C. Davies Sherborn, London, England. 27297.
- PACKARD, R. L. (U. S. National Museum): Economic minerals from Maine. 27339.
- PAGE, ALFRED (Prairie du Sac, Wis.): A fine series of fossils characteristic of the "fifth trilobite zone" of Owen, consisting of 34 specimens, representing the Cambrian genera *Aglaspis*, *Dikellocephalus*, *Illanurus*, and *Lingulella*. 27421.
- PAINTER, PARK (Pittsburg, Pa.): Carved stone pipe, bird-shaped, obtained from a mound on McKee's Rocks, on the banks of the Ohio River, Allegheny County, Pa. 27975.
- PALMER, EDWARD (Department of Agriculture): Crayfish from Blue Lakes, and specimens of *Entomostraca* from Big Butte Station, Idaho; land and fresh-water shells, ethnological objects obtained from the Shoshone and Ban-nock Indians of Idaho, mussel shells from an old Indian camp near Blue Lake settlement, on the banks of Snake River (27409); sponges obtained princi-

- PALMER, EDWARD—continued.
pally from San Diego Harbor, California (27570); dried sponges from Corpus Christi Bay, Texas (27602).
- PALMER, WILLIAM (U. S. National Museum): Skull of a raccoon, *Procyon lotor*, from Connecticut (27462); turtle from Chicago, Ill. (27824); specimens of *Planorbis parvus*, Say, from Patuxent River, Maryland (28085); gray squirrel, *Sciurus carolinensis*, from Mount Vernon, Va. (28168); 6 eggs (1 set) of American Crow, 9 eggs (2 sets) of Fish Crow from near Washington, D. C. (28209); young gray squirrel, *Sciurus carolinensis*, from Marshall Hall, Md. (28250).
- PARKER, Lient J. F., U. S. N. (New York City): Samoan headdress. 27792.
- PAYN, ELIAS J. (Tres Piedras, N. Mex.): Bromide silver ores from the Union Group of silver mines of Rio Arriba County (27352); ores and rocks from New Mexico (27438); Indian pottery from San Juan, Mexico (27477); quartz (27485); ores from Mexico and a specimen of mica from Petasco Mines, Rio Arriba County (27596).
- PAYNE, ROBERT H. (Washington, D. C.): Three chromo-zincographs, proofs printed by the donor. 28013.
- PEDERSON, HERMAN (Spring Grove, Minn.): Three specimens characteristic of the Minnesota Trenton formation, two species of brachiopods, and a coral. 27791.
- PENDLETON, JAMES P. (Bristol, Tenn.): Wooden watch. Deposit. (Returned.) 27532.
- PENFIELD, Prof. S. L. (Yale College, New Haven, Conn.): Feldspar and quartz from Branchville, Conn. 27343.
- PENROSE, Dr. G. H., U. S. A. (Washington, D. C.): Grapevine Spider, *Phyllophemus pandorus*, silk moth, *Telega polyphemus*, and a Swallow-tailed Butterfly, *Papilio troilus*. 27264.
- PERKINS, E. C. (Prairie du Sac, Wis.): A fine series of Upper Cambrian fossils from the "fifth trilobite zone" of Owen, consisting of 16 specimens, and containing perfect *Aglaspis* and *Illenus*; also 2 plaster casts of the first entire Cambrian trilobite discovered in Wisconsin. 27422.
- PETTER, W. (See under Istituto Físico-Geográfico, National Museum of Costa Rica, San José.)
- PETTIGREW, F. W., through Prof. Lester F. Ward, Fossil resin from Black Hills, South Dakota. 27939.
- PHELPS, G. R. (Washington, D. C.): Thirty-nine arrow-heads from Connecticut. 28031.
- PHILLIPS, L. E. (San Francisco, Cal.): Fossil oyster and fossil wood. 27231.
- PHILLIPS, VICTOR E. (Olney, Ill.): Specimens of *Productus pertenuis*, Meek, *Chonetes Geinitzianus*, Waagen, *Pleurotomaria* cfr. *brazonensis*, and *Pleurotomaria Marcouiana*, Geinitz (?) from coal horizon No. 13, Illinois section. 27429.
- PICO, JUAN (Ventura, Cal.), through H. W. Henshaw: Digging stick, weighted, and 2 tubular pipes. Purchase. 28296.
- PIERCE, GRANVILLE T. (Somerville, Mass.): One hundred and seventeen small, rude-chipped implements and 14 chips and flakes of white quartz, 4 arrow-heads (1 each of slate, argillite, quartzite, and quartz), 13 fragments of flint arrow-heads, surface finds, from Southburg, New Haven County, Conn. 27744.
- PILSBRY, H. A. (Academy of Natural Sciences, Philadelphia, Pa.): Fresh-water shells from Florida. 28264.
- POLLOCK, M. B. (Osso, Va.): Squirrel (*Sciurus niger cinereus*). 27919.
- POST-OFFICE DEPARTMENT, U. S. (Dead-Letter Office): Horned toad. 27243.
- POWELL, Maj. JAMES W. (See under Smithsonian Institution, Bureau of Ethnology, and Interior Department, U. S. Geological Survey.)
- POWELL, T. H. (London, England): Forty-six stone implements from Suffolk and Oxfordshire, England. Exchange. 27665.
- PRAIN, DAVID. (See under Royal Botanic Garden, Sibpur, India.)
- PRANG, L., & Co. (Roxbury, Mass.): Set of 5 progressive proofs of a landscape in photo-chromolithography. 27692.
- PRENTISS, Mr. (New York City): Stone implements from Skaneateles, N. Y. 27610.
- PRICE, RICHARD JOHN LLOYD, through Mr. Alfred Day: Specimens of Fullers' earth from Rhiwlas; Fullers' earth, Vrongoch, near Bala, North Wales, selected from Mr. Price's exhibit at the World's Columbian Exposition. 27880.

- PRILL, Dr. A. G. (Lebanon, Oreg.): Eleven eggs (1 set) of Oregon Ruffed Grouse, from near Sodaville, Oreg. (27197); 5 birds' skins, representing 3 species (27302).
- PRINCETON COLLEGE (Princeton, N. J.), through Professor Scott: Antlers, jaws, and other specimens, also casts of fossil plants, selected from the exhibit of the college at the World's Columbian Exposition. 27827.
- PROCTOR, ABNER C. (Washington, D. C.): Copy of newspaper, "Autograph of Remarker," Huntington, Vt., January 19, 1862. 27606.
- PUSHAW, GEORGE N. (Pittsfield, Me.): Two stone implements (gouges) from near Pittsfield, and 37 fragments of pottery from Lake Pontchartrain, Louisiana. 27987
- QUANTERELL, O. L. (Lake City, Fla.): Skin of Song Sparrow, *Melospiza fasciata*. 28099.
- QUARTERMASTER'S DEPARTMENT, U. S. Army. (See under Prof. C. H. Gilbert.)
- QUEENSLAND MUSEUM (Brisbane, New South Wales), Mr. C. W. de Vis, curator: Minerals and ores from Queensland. Exchange. 27208.
- QUELCH, J. H. (Commissioner for British Guiana, World's Columbian Exposition): Stuffed fish (*Arapaima gigas*). 27931. (See under British Guiana Commission to the World's Columbian Exposition.)
- QUINN, Prof. Dr. (Catholic University, Washington, D. C.): Minerals from the mines of Lavriom, Greece. 27681.
- RABBITT, S. E. (Washington, D. C.): Black Magpie Pigeon, Yellow Magpie Pigeon, Magpie Pigeon. 27608, 27635, 28078.
- RACKETT, GRANT B. (Huntington, N. Y.): Arrow-head found in a cornfield near the shore of Huntington Bay. 28221.
- RAGSDALE GEORGE H. (Gainesville, Tex.): Minerals, rocks, and fossil leaves from the Dakota sandstone, Woodbine, Cooke County, Tex., consisting of *Cinnamomum elipsoideum*, Sap. and Mar., *Cinnamomum* sp., and one indeterminate fragment (27166); fossil leaves from Dakota sandstone (27943).
- RAINE, WALTER (Toronto, Ontario, Canada): Skin, nest, and 5 eggs (the latter new to Museum collection) of RAINES, WALTER—continued.
Leconte's Sparrow, *Ammodramus Lecontei*, from Raeburn, Long Lake, Manitoba: 7 eggs (2 sets) and nest of McCown's Longspur from Manitoba and Assiniboia, Canada. 28120.
- RALPH, Dr. WILLIAM L. (Utica, N. Y.), through Maj. Charles Bendire, U. S. A.: Ten birds' skins, representing 3 species, from Texas (27285); Sennett's Warbler, *Compothlypis nigrilora*, and 5 specimens of a Yellow-throat Warbler, *Geothlypis poliocephala Ralphi* (new to science) (27365); 3 skins of Swainson's Warbler, *Helinaia Swainsoni*, from South Carolina and Georgia, and 2 skins of Prairie Horned Lark, *Otocoris alpestris praticola*, from Oneida County, N. Y. (27664); 4 polished stone hatchets from San Mateo, Putnam County, Fla. (27697); 2 skins of Bachman's Warbler, *Helminthophila Bachmani*, from Beauford, Fla. (28051); a very valuable collection of birds' eggs and nests, embracing 614 sets of eggs and containing 2,222 specimens, representing 212 species and subspecies (many of the eggs are quite rare, and 11 species and subspecies are new to the collection) (28101). (See under Smithsonian Institution.)
- RAMSER, J., & SON (Rock Island, Ill.): Watch. Deposit. 27619.
- RANDALL & CLAPP (Brattleboro, Vt.): Two watches. Deposit. 27690.
- RATHBUN, RICHARD. (See under Franklin Weld.)
- RATHBUN, S. F. (Seattle, Wash.), through Maj. Charles Bendire, U. S. A.: Seven birds' skins, representing 6 species (27795); nest and four eggs of Macgillivray's Warbler (27815); 4 birds' skins from Washington (28033).
- RAUB, GEORGE T. (Washington, D. C.): Beaver, *Castor canadensis*, from Four Mile Run, Virginia. 28163.
- REED, JOSEPH (keeper, Island Beach Life-Saving Station, Seaside Park, N. J.): Swimming crab, *Neptunus Gibbesii*, Stimpson. 27467.
- REEVES, JAMES A. (Joplin, Mo.): Calcite from Aurora, Mo. 27716. (See under E. T. Molyneux.)
- REICHARD, ROBERT (Washington, Mo.): Clock and watch. Deposit. 27592.
- REID, J. A. (Bolling, Ala.): Wheel Bug, *Prioidius cristatus*, L. 27776.

- REINICK, W. (Philadelphia, Pa.): Specimens of *Mordellistena splendens*. Exchange. 28192.
- REMINGTON, W. T. (Chat, Cal.): Giant Owllet Moth, *Erebus odora*. 27573.
- RENFIGO, JULIO. (See under Government of the United States of Colombia.)
- RENICK, F. H. (Seattle, Wash.): Nest and 4 eggs of Thrasher's Junco (27722); skin of Least Titmouse, *Psaltriparus minimus*, and Gambel's Sparrow, *Zonotrichia Gambeli*, nest and 7 eggs of Bush-tit, nest and 4 eggs of Gambel's Sparrow (28248).
- REYNOLDS, O. L. (Covington, Ky.): Six badges of the Grand Army of the Republic, Department of Kentucky. 28203.
- RICH, S. P. (Provincetown, Mass.): Skeleton of White Whale, *Delphinapterus leucas*. Purchase. 27313.
- RICHMOND, CHARLES W. (U. S. National Museum): Three bats (gift) (27232); reptiles from Nicaragua (gift) (27377); 11 reptiles from Nicaragua (gift) (27382); small collection of fishes, consisting of *Scombroides*, *Heros*, *Chromis*, *Philypnus*, *Pimelodus*, *Characodon*, *Tetragonopterus*, and *Belonesox*, made in Nicaragua (purchase) (28042); mammal skins and skulls (gift) (28121); alcoholic and dry insects from Nicaragua (purchase) (28181); skin and skull of *Lepus sylvaticus* and alcoholic specimens of *Mus musculus*, from Smiths Island, Northampton County, Va. (gift) (28216); 16 eggs (4 sets) of Seaside Sparrow, also 4 nests, 3 eggs (1 set) of Boat-tailed Grackle, 11 eggs (1 set) of Clapper Rail, from Northampton County, Va. (gift) (28222); 12 birds' skins, crabs, and shrimps from Smiths Island (gift) (28224); specimens of *Litorina irrorata* and *Helix thyroides* from Virginia (28252).
- RICHARD, Rev. R. H. (Auburn, Sydney, New South Wales): Pearly nautilus from New Britain Island, Pacific Ocean. Purchase. 27458.
- RIDGWAY, ROBERT (U. S. National Museum): Six skins of American Crow, *Corvus americanus*, from near Brookland, D. C. (27634, 27693); 4 skins of American Crow from Maryland and the District of Columbia (27644).
- RILEY, Prof. C. V. (U. S. Department of Agriculture): Lizard (*Thecadactylus rapicaudus*), from Montserrat, West Indies. 28115. (See under Department of Agriculture.)
- ROBINSON, Lieut. WIRT, U. S. A.: Three birds' skins, representing 2 species from Florida and Georgia, skull of young Jaguar, *Felis onza*, from near Guaduas, Colombia, and skull of *Lynx rufus*, from Buckingham County, Va., also land shells from Magdalena Valley (27331); 204 birds' eggs, from the vicinity of Richmond, Va. (27334); Yellow Rail, *Porzana noveboracensis*, from Nelson County, Va. (27394); Tinamou, *Nothoprocta* sp. in the flesh, from Argentine Republic (28034); 97 birds' skins, representing 41 species from northeast Florida (purchase), 10 eggs (5 sets) of Gray Kingbird, 4 eggs (1 set) of Florida Jay, 3 eggs (1 set) of Wilson's Plover, 9 eggs (4 sets) of Least Tern, 3 eggs (1 set) of Scott's Seaside Sparrow, and 3 eggs of Marian's Marsh Wren (the two last-named species, are new to the Museum collection (gift) (28213).
- ROCKHILL, W. W. (Third Assistant Secretary, Department of State): Package of Korean tobacco and package of "white tea" from China (27793); 9 Chinese jew's-harps and 15 Chinese pigeon whistles, from Peking (28177). (See under Department of State.)
- RODIGAS, EUGENE (Sivas, Turkey), through Mr. H. M. Jewett: Collection of plants, from Asia Minor. 27562.
- ROESE, Prof. W. A. (See under German Government Printing Office.)
- ROMEYN, Capt. HENRY, U. S. A.: Io Moth, *Hyperchiria io*. 27283.
- ROWLAND, Miss KATE M.: Photograph of portrait of John Thomson Mason. 27276.
- ROYAL BOTANIC GARDEN (Sibpur, India), through David Prain, curator of herbarium and librarian: Dried plants. Exchange. 28082.
- ROYAL DANISH COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION. (See under Viggo Schlegel.)
- ROYAL SWEDISH COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION. (See under A. E. Nordenskiöld.)

- RUBIN, CHARLES A. (Fort Missoula, Mont.): Water-worn pebble, resembling a worked stone, from the bed of Bitterroot River, Montana. 27971.
- RUMMEL, F. A. (Baltimore, Md.): Black Priest Pigeon. 28247.
- RUTTER, Prof. CLOUD (Long Pine, Nebr.): Skin of Prairie Sharp-tailed Grouse, *Pediocates phasianellus campestris*. 27179.
- RUTTER, Capt. JOHN (British ship *Aladdin*), through Hon. L. J. Walker, United States consul, Cork, Ireland: Butterfly (*Hyalimnas missippus*) and a cricket (*Achetea bimaculatus*), which were captured on board ship near the Cape Verde Islands. 27955.
- SAGE, F., & Co. (See under Thomas Cook & Son.
- SAGE, J. H. (Portland, Conn.): Two rattlesnakes. 27317.
- ST. GOTHARD RAILWAY COMPANY, through Hon. A. Holinger, commissioner from Switzerland to the World's Columbian Exposition: Three plastic maps illustrating the construction of circular tunnels on the St. Gothard Railway, made under the direction of Prof. F. Bleker, of Zurich, from the exhibit of the company at the World's Columbian Exposition. 27862.
- SAL MOUNTAIN ASBESTUS COMPANY (Sal Mountain, Ga.): Asbestos (27545, 27631); large mass of asbestos from the exhibit of the company at the World's Columbian Exposition (27874).
- SALVADOR, NATIONAL MUSEUM OF (Republic of Salvador, Central America), through Prof. Carlos Castro, curator: Twenty-one birds' skins, representing 20 species, from Salvador. Exchange. 27301.
- SAMPSON, LILIAN V. (Germantown, Pa.): Specimens of Chiton, from Jamaica, West Indies. 28106.
- SANO, K. (Tokyo, Japan): Model representing a marriage procession of a Daimeo; obtained from the exhibit at the World's Columbian Exposition. 27837.
- SANTA CLARA COUNTY, CAL., EXHIBIT TO WORLD'S COLUMBIAN EXPOSITION, through R. P. McGlincy, Campbell, Cal.: Specimens of magnesite and chrome iron ore, from the exhibit at the World's Columbian Exposition. 27877.
- SARGENT, H. B. (New York City): Five eggs (1 set) of Purple Grackle *Quiscalus quiscula*, and a pair of crow blackbirds; from Shelter Island, N. Y. 27354.
- SAWYER, GEORGE M. (Schroon Lake, N. Y.): Old coin found in the vicinity of Schroon Lake. 27470.
- SCHAEFFER, Dr. E. M. (Washington, D. C.): Femur of a Canada goose, showing a fracture and repair. 27648.
- SCHARFF, C. F. (Prairie du Chien, Wis.): Specimen of *Receptaculites Oweni*, commonly known as "sunflower coral." 27424.
- SCHERRER, LOUIS P. (Morristown, N. J.): Nest and 4 eggs of Song Sparrow. 28300.
- SCHLARBAUM, PAUL (Loveland, Colo.): Two specimens of *Euhagena nebraskæ*, H. Edw. Exchange. 28254.
- SCHLEITEL, VIGGO, through Royal Danish Commission to the World's Columbian Exposition: Chalk, building stones, and a series of raw and burnt flints, from the exhibit of Denmark at the World's Columbian Exposition. 27866.
- SCHMID, EDWARD S. (Washington, D. C.): Japanese dancing mouse, *Mus musculus* (27156); monkey (*Cercopithecus Campbelli*) (27159); boa constrictor (27210); pigeon (27360); African gray parrot, *Psittacus erythacus*, in the flesh (27403); 2 eggs of *Calospitta novæ-hollandiæ* (27484); myna (*Eulabes*) sp. and a starling, *Sturnus vulgaris*, in the flesh (27617); through Mr. N. R. Wood, Yellow-naped Parrot, *Amazona auripalliata*, in the flesh (27747); hare (*Lepus americanus*), from Maine (28165); Texas Cardinal, *Pyrhuloxia sinuata*, in the flesh (28278).
- SCHMID, L. A. (Washington, D. C.): Guinea-pig. 28198.
- SCHUCHERT, CHARLES (U. S. National Museum): Impression from a relief block made under an artificial negative. 27983.
- SCHWAGERL, E. O. (Seattle, Wash.): Seeds from the vicinity of Puget Sound. 27550.
- SCHWARZ, E. A. (Washington, D. C.): Three rare beetles from North Carolina, consisting of *Dasycerus carolinensis*, *Pterostichus Blanchardi*, and *Plotynus* nov. sp. Exchange. 27209.

- SCHERZINGER, G. (Fond du Lac, Wis.): Three watches. Deposit. 27641.
- SCIDMORE, Miss E. R. (Washington, D. C.): Fifty-nine pieces of porcelain and pottery, specimen of cloisonné, and 3 small horn spoons. Deposit. 27510.
- SCLATER, P. L. (Zoological Society of London, London, England): Mammal skins and skulls. 28173.
- SCOLLIK, J. W. (U. S. National Museum): Two specimens of *Ceruchus piceus*, pupa of *Prionus*, and larvæ of *Lachnosterna*. 28277.
- SCOTT STAMP AND COIN COMPANY (New York City): The International Postage Stamp Album, in sheets (27238); The International Postage Stamp Album, 1894 edition, two volumes, in sheets (27694).
- SCOTT, Professor. (See under Princeton College.)
- SCUDDER, Prof. S. H. (Cambridge, Mass.): Eleven species of *Centophili* (new to the Museum collection), including 9 type specimens. Exchange. 28284.
- SEIFERT, OSCAR (Newark, N. J.): Two pigeons in the flesh. 27819.
- SEITER, J. P. (Bridgeport, Ala.), through Dr. C. Hart Merriam: Specimen of *Chirocephalus texanus* (?), Packard. 27407.
- SEKKA, SHIMA (Japan), through Mr. Gustavus Goward: Wooden statue, carved by Mr. Sekka, of Baron Ii Kâmon-Nokâmi Nâosuke, late regent of the Japanese Empire, who was assassinated in the year 1860 for consenting, as regent, to the admission of foreigners into Japan; obtained from the World's Columbian Exposition. 27845.
- SEMPERS, J. F. (Aiken, Md.): Three birds' skins, representing 3 species, from Massachusetts and Maryland. 27224.
- SEVEILLE, Madame J. MATHERON (Grand Pressigny, Indre-et-Loire, France): Two worked flints. Exchange. 27327.
- SHANNETT, G. E. W. (Forks, Pa.): Small slab containing Chemung terrane fossils. 27654.
- SHANNON, Dr. W. C., U. S. A. (See under Intercontinental Railway Commission.)
- SHARP, Dr. DAVID. (See under British Museum.)
- SHEPARD, Dr. C. U. (Charleston, S. C.): Twenty-five specimens of lazulite, 1 specimen of pyrophyllite, 1 of rutile (group of crystals), from Graves Moun-
- SHEPARD, Dr. C. U.—continued.
tain, Lincoln County, Ga., and 3 specimens of tantalite, from Coosa County, Ala. Lent. 27769.
- SHEPARD, Miss IDA M. (Long Beach, Cal.): Shells. (27155, 28176).
- SHERBORN, C. DAVIES. (See under Sir Richard Owen.)
- SHERBORN, C. W. (See under S. P. Avery.)
- SHIELDS, J. W. (Baltimore, Md.): Specimens of *Cœlosis biloba*, L. from Navassa (27908); 2 sphinx moths, *Pachylia ficus*, L. and *Ambulyx strigilis*, L. (28030).
- SHIMAMURA, TETSUKA & Co. (World's Columbian Exposition): Collection of ethnological objects, 9 musical instruments, drum used in religious observances, figure of Buddha, temple swords, model of pagoda, and ancient temple mask obtained by purchase from the company's exhibit at the World's Columbian Exposition. 27832.
- SHOLLAR, CHARLES W. (Williamsburg, Pa.): Arrow-head from Clover Creek, Blair County, Pa. 27649.
- SHRIVER, HOWARD (Cumberland, Md.): Specimen of *Encrinurus punctatus* (?) from the Clinton group (27390); 22 specimens from the Clinton, Niagara, Oriskany, and Hamilton formations (27522); specimen each of *Strophonella patenta*, Hall and *Dalmanites limulurus*, Green (27790).
- SHUFELDT, Dr. R. W. (Takoma, D. C.), and Mr. WILLIAM BREWSTER (Cambridge, Mass.): Trunk' skeleton of a hybrid grouse. 27178.
- SHUFELDT, Dr. R. W., U. S. A. (Takoma, D. C.): Skull of an Alligator Gar Pike (gift) (27710); alcoholic specimen of ptarmigan, *Lagopus Welchi* (exchange) (27728).
- SILVER, Dr. EARL B., (Jersey City, N. J.): Two-headed King Snake from Virginia. 27753.
- SIMMS, CHARLES N. (Roncerverte, W. Va.): Drilled ceremonial ax found on Anthonys Creek, Greenbrier County (27788); piece of ferruginous sandstone with cavity, iron tomahawk or hatchet, 8 flint arrow-heads, quartzite arrow-head, polished hatchet, 4 flint arrow-heads, and a petrified shell (27998).

SIMPSON, CHARLES T. (See under J. B. Henderson, jr., and Oscar Sturges.)

SINCLAIR, S. (See under Australian Museum.)

SINGLEY, J. A. (Giddings, Tex.): Carboniferous fossils from Texas (gift) (27448); Cretaceous and Carboniferous fossils (gift) (27529); 74 flint implements from various localities in Texas (deposit) (returned) (28018).

SIoux VALLEY STONE COMPANY (Jasper, Minn.): Four blocks of quartzite polished by wind-blown sand, from the company's exhibit at the World's Columbian Exposition. 27883.

SISCO, E. M., (Walton, Kans.): Specimen of *Udeopsylla robusta*, Scud. 28251.

SLANE, L. A. (Enid, Okla.): Structureless hair worm, *Gordius variabilis*. 28045.

SMITH, HARLAN I. (Saginaw, Mich.): Fresh-water crustaceans and sponges (27227); crayfishes (27417, 28179).

SMITH, Mr. (See under Interior Department, U. S. Geological Survey.)

SMITH, JOHN B. (Brown, Colo.): Crystal of magnetite. 27256.

SMITH, Dr. M. C. (Lynn, Mass.): Gypsum from Wilkins Quarry, Hauts County, Nova Scotia, and howlite from Wentworth Quarry, Hunter County, N. C. 27396.

SMITH, SHERMAN W. (Boston, Mass.): Egg of a reptile. 27309.

SMITH, THOMAS J. (Cabin John, Md.): Galena and chalcopyrite from Glen Echo Consolidated Quarry Company, Montgomery County, Md. 27359.

SMITH, WILLIAM G. (Loveland, Colo.): Spermophile, *Spermophilus tridecemlineatus*. 28267.

SMITHSONIAN INSTITUTION.

Anthropometric apparatus. Purchase. 27527.

The five following-mentioned contributions, made direct to the Smithsonian Institution, have been deposited in the National Museum. These were received from—

HUNT, Mrs. WILLIAM,¹ Washington, D. C. 27959.

IOWA MASONIC LIBRARY,¹ Cedar Rapids, Iowa. 27715.

SMITHSONIAN INSTITUTION—continued

RALPH, Mr. WILLIAM L.,¹ Utica, N. Y. 27285, 27365, 27664, 27697, 28051, 28101.

URUGUAY,¹ 27727.

VAIL, Mrs. AMANDA (deceased),¹ 28226.

Bureau of Ethnology, Maj. J. W. Powell, Director—

Collection of ethnological objects from southeastern Alaska, collected by Mr. Herbert Ogden, of the U. S. Coast Survey (27509); collection of masks, harpoons, models of boats, dishes, basketry, bows, carvings, and clothing, obtained by J. Henry Turner from the Eskimos and Indians of Alaska (27937); large Menomini dugout canoe, obtained by Dr. W. J. Hoffman in Wisconsin (28062); inlaid digging stick, obtained by Mr. H. W. Henshaw (28070); birch-bark canoe, obtained by Dr. Hoffman in Wisconsin (28091); dog-soldier's stick, catlinite pipe and stem, wooden bowl, and a pair of Mexican spurs, collected by Mr. James Mooney (28094); collection of rocks from the Clifton soapstone quarry in Fairfax County, Va., (28100); section of a stratum of pipestone polished on one side, showing glacial action thereon, collected by Mr. Charles A. Bennett at the pipestone quarry, Minnesota, and obtained by the Bureau of Ethnology from Mr. Bennett's exhibit at the World's Columbian Exposition (28903).

United States National Museum, Dr. G. Brown Goode, Assistant Secretary, in charge:

Collection of ethnological objects, 13 musical instruments, and mammal skins, skulls, and bones, collected by William Harvey Brown (27184); birds' skins, mammal skins, and skulls, collected in Arizona and Mexico by Mr. Frank X. Holzner during his connection with International Boundary Commission (27219); 4 musical instruments from Bethlehem, Syria, obtained by Dr. G. Brown Goode from the World's Columbian Exposition (27399); pressed plants

¹ See under above names for full entries.

SMITHSONIAN INSTITUTION—continued.

United States National Museum—cont'd.

from Arizona, collected by Mr. Holzner (27433); 2 agalmatolite carvings, model of the bridge over the Tjitjatt River, Java, collection of musical instruments from Cairo and Constantinople, and a collection of objects illustrating religious observances (purchased from the World's Columbian Exposition) (27844); collection of medals commemorative of the Columbus quadri-centennial celebrations of 1892 and 1893, obtained from the World's Columbian Expositions (27863); 2 specimens of gold in quartz, 1 specimen of magnetite in chlorite schist, from Pimmet Run, Fairfax County, Va., 2 specimens of actinolite and calcite, specimen of calcite and stilbite in diorite, from Howard University shaft, Washington, D. C., collected by Mr. Wirt Tassin (28130); model of Behaim globe (purchased for World's Columbian Exposition) (28811).

National Zoological Park, Dr. Frank Baker, Superintendent—

Monkey (*Macacus*) and Aguti (*Dasyprocta*) (27160); 1 specimen each of *Felis pardalis*, *Cercopithecus patas*, and *Elastomognathus* sp. (27307); 3 specimens of Townsend's Spermophile, *Spermophilus Townsendi* (27328); skeleton of Peccary, *Dicotyles tajacu* (27341); Llama, *Auchenia llama* (27375); Barn Owl, *Strix pratincola*, in the flesh (27405); Beaver, *Castor canadensis*, a Peccary, *Dicotyles tajacu*, and a Spider Monkey, *Ateles* sp. (27464); armadillo, *Tatusia g-cincta* (27474); Paca, *Calogenys paca* (27483); raccoon, *Procyon lotor*, and a Muskrat, *Fiber zibethicus* (27486); Blue and Yellow Macaw, *Ara ararauna* (27492); Fish hawk (27525); Oryx Antelope, *Oryx leucorys*, and a Muskrat, *Fiber zibethicus* (27533); rattlesnake (27555); domestic White Ferret, *Putorius furo* (27572); Kangaroo, *Marcopus* sp., Kit Fox, *Vulpes velox*, and a macaque, *Macacus* sp. (27601); Puma, *Felis concolor* (27670); Spider Monkey, *Ateles* sp. (27702); camel, *Camelus dromedarius* (27724); Dog-faced Ape, *Cynocephalus sphinx* (27762); Spider Monkey, *Ateles* sp. (27765); Black Bear, *Ursus*

SMITHSONIAN INSTITUTION—continued.

National Zoological Park—continued.

americanus (27799); young mandrill, *Cynocephalus mormon* (27903); Scarlet Ibis, *Guara rubra*, in the flesh (27922); Capuchin Monkey, *Cebus apella*, Black Bear, *Ursus americanus*, and a Peccary, *Dicotyles tajacu* (27924); *macacus* (28001); 2 Virginia Deer, *Cariacus virginianus*, and a Zebu, *Bos indicus* (28026); Axis Deer, *Cervus axis*, and a Gray Fox, *Urocyon virginianus* (28056); Barred Owl (28057); marmoset, *Hapale jacchus* (28073); *Larus argentatus smithsonianus* (28074); *Craz panamensis* (28075); Golden Eagle, *Aquila chrysaetos canadensis*, and Sparrow Hawk, *Tinnunculus sparverius* (28080); skin of an African porcupine (28108); Muscovy Duck and a snake from the West Indies (28164); Cacomistle, *Nasua narica*, from Cuernavaca, Morelos, Mexico (28166); Bald Eagle, *Haliastur leucocephalus* (28167); Ocelot, *Felis pardalis*, from New Orleans, La. (28309); skin of Puma, *Felis concolor*, from Fort Keogh, Mont. (28310); skeleton of Puma, from Montana (28311).

SNEDKER, GEORGE W. (Brooklyn, N. Y.): "The Daily Richmond Inquirer," dated August 29, 1864, and a copy of "The Daily Register," of Petersburg, Va., dated August 26, 1864. 28303.

SNOWDON, R. R. (Ocala, Fla.): Ten specimens of Florida phosphates. 27312.

SOPHIA MUSEUM (Sophia, Bulgaria), through Bulgarian Commission to the World's Columbian Exposition: Fourteen musical instruments, 5 costumed lay figures of Bulgarian peasants, Bulgarian water jug, 2 saucers, 2 vases, scratch back and 2 pairs of shoes, also 8 photographs of Bulgarians, showing costume, purchased from the exhibit of the Sophia Museum at the World's Columbian Exposition. 27843.

SORNBERGER, JEWELL D. (Cambridge, Mass.): Three eggs of Labrador Jay, (new to the Museum collection). 27576.

SOUHAMI, A. R. (World's Columbian Exposition): Silver object used on the scroll of the law in Jewish worship, purchased from the Turkish exhibit at the World's Columbian Exposition. 28902.

- SOUTH CAROLINA RAILWAY EXHIBIT TO THE WORLD'S COLUMBIAN EXPOSITION, through R. G. Ward, road master: Thirty-eight pieces of track rail, plates, spikes, and other articles, used during the years 1830-31, also 15 photographs, from the exhibit of the railway at the World's Columbian Exposition. 27860.
- SOUTH DAKOTA, STATE COMMISSION OF, TO THE WORLD'S COLUMBIAN EXPOSITION, through Thomas H. Brown, executive commissioner: Tin ore and mica, from the State exhibit at the World's Columbian Exposition. 27893.
- SPARKMAN, W. A. (Murray, Ky.): Notched digging implement; from Calloway County. 28304.
- SPERRY, J. CLARENCE (Big Trees, Cal.): Eight birds' eggs, from Calaveras County, and 3 nests. 27192.
- SPIES, ALBERT (Newark, N. J.): *Cecropia* Silk Moth. 28289.
- SPRINKEL, J. W. (Dulinsville, Va.): Specimen of *Cicada marginata*, Say (27336); Alder borer, *Desmocerus palliatus*, Fab. (28255).
- SQUYER, HOMER (Mingusville, Mont.): Fresh-water and land shells, from Beaver Creek, Montana (27154); Cretaceous fossils (27944); land and fresh-water shells from the drift on the banks of Beaver Creek (28111); scorpion (*Scorpiops boreus*, Girard) (28220).
- STALKER, H. E. (Oxford, Wis.): Hair worm, *Gordius* sp. 27568.
- STANTON, T. W. (See under John Blanchard and also under Edwin Blackburn.)
- STARIN, JOHN H. (New York City), through Arthur T. Wayne: Eight birds' skins, representing 4 species, from Florida. Exchange. 28294.
- STATE, DEPARTMENT OF, through Mr. W. W. Rockhill, Third Assistant Secretary: Small collection of articles of Russian manufacture, consisting of a cloth coat, 5 leather coats and a pair of leather trousers, book of samples of fabrics, 15 small pieces of textile fabrics, and a large piece of textile fabric (gift) (27767); ceremonial robe belonging to the King of Samoa (deposit) (28063).
- STATE, DEPARTMENT OF—continued.
(See under Henry W. Andrews, Government of Egypt, and Intercontinental Railway Commission.)
- STATE MUSEUM (Raleigh, N. C.), through Thomas C. Harris, curator: Fossil bones of the head and jaw of *Misotermis kirreanus*, also fossil oyster shells. 28061.
- STEBBINS, GEORGE R. (Washington, D. C.): Black Carrier Pigeon. 27652.
- STEJNEGER, DR. LEONHARD (U. S. National Museum): Skin of Bald Eagle, *Haliaeetus leucocephalus*, from Bering Island, Kamchatka. Exchange. 27672.
- STEPHENS, F. (Witch Creek, Cal.): Rattlesnake, from San Jacinto Mountains; 27226.
- STEPHENS, WILLIAM (Camp Verde, Ariz.): Two specimens of white opal. 27395.
- STERKI, DR. V. (New Philadelphia, Ohio): Four species of fresh-water shells. 28055.
- STEVENS, E. A., (Hoboken, N. J.): Machinery of the first steam screw-propeller boat, built by John Stevens in 1804, the first to navigate the waters of any country, mounted in a model of the original boat. Deposit. 27810.
- STEVENS, MISS TEENA (Morrow, Ohio): Cocoon of *Cecropia* Silk Moth. 28043.
- STEWART, DR. T. B. (Lock Haven, Pa.): Plaster cast of a ceremonial stone object, found near Lock Haven. 27218.
- STRANAHAN, J. J. (Put-in Bay, Ohio): Saliva thrown by a rattlesnake. 27262.
- STRAUS, SIMON (Belleville, Ill.): Four watches. Deposit. 27604.
- STRICKLER, HENRY (Colorado Springs, Colo.): Concretion of hematite or iron oxide, found in solid rock. 27595.
- STURGES, OSCAR C. (Kildare, Okla.), through C. T. Simpson: Five specimens of Upper Carboniferous fossils, consisting of 5 specimens of *Seminula subtilita*, Hall, 1 specimen of *Derbya crassa*, Meek and Hayden (?), specimen of *Allorisma subcuneata*, M. & H., also several species of Lamellibranchia (28025); 10 starfishes and 5 sea-urchins from Rocky Bay, San Juan Island, San Juan County, Wash. (28137).
- STURTZ, B. (Bonn, Prussia): Rocks from Europe. Exchange. 27495.

- SULLIVAN, G. R. (Washington, D. C.): Cowbird, *Molothrus ater*, in the flesh, from Virginia. Exchange. 27645.
- SUMNER, J. W. (Kernville, Cal.): Native antimony from Kern County. 27721.
- SURBER, T. (White Sulphur Springs, W. Va.): Ninety-five birds' eggs (22 sets) representing 19 species, also 1 nest (27222); 15 eggs (5 sets) and 1 nest (27237).
- SWEDISH COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION: Chalk and materials for making cement, from the exhibit of Sweden at the World's Columbian Exposition. 27867.
- SWITZERLAND COMMISSION TO THE WORLD'S COLUMBIAN EXPOSITION. (See under St. Gothard Railway Company.)
- TABER, R. G. (New York City): Slab of labradorite. Purchase. 27616.
- TAKAYAMA, DR. KASAI (Tokyo, Japan), through Japanese Central Association to World's Columbian Exposition: Plans of Dr. Takayama's School of Dental Surgery. 27847.
- TALBOT, MRS. R. C. (Paris, Ky.): Cecropia Silk Moth. 27162.
- TALMAGE, DR. J. E. (Salt Lake City, Utah): Selenite crystals from Wayne County. Exchange. 27164. (See under Deseret Museum.)
- TASSIN, WIRT (U. S. National Museum): Five specimens of glockerite, from the reservoir tunnel, Cabin John, Md. (27755); 20 specimens of pyrite altering to limonite, from Glen Echo, Montgomery County, Md. (27960); 2 specimens of stilbite from foundry branch shaft, Georgetown, and a specimen of analcite, from the same locality (28027). (See under Interior Department, U. S. Geological Survey, and Smithsonian Institution, U. S. National Museum.)
- TAYLOR, E. J. (Washington, D. C.): Archaeological objects, from Ashland, Ky., consisting of 342 articles. Exchange. 27984.
- TECHNOLOGICAL MUSEUM (Sydney, New South Wales), through Mr. Walter W. Froggart: Twelve species of Australian Thyridae. Exchange. 27340.
- TELLERY, S. J., & Co. (New York City): Collection of Indian temple utensils and terra-cotta figures (27808); gun of ancient manufacture from India (27809); collection of alabaster idols, from the same locality (28175). Purchase.
- TETSUMA, H. K., & Co. (Japan): Plaque and sword, purchased from the Japanese bazaar at the World's Columbian Exposition. 27832.
- THOMPSON, C. (Washington, D. C.): Larva of Regal Walnut Moth, *Citheronia regalis*. 27245.
- THOMPSON, J. W. (See under Fish Commission, U. S.)
- THOMPSON, TAYLOR (Remington, Va.): Rhinoceros Beetle, *Dynastes tityus*. 27242.
- TIFFANY & Co. (New York City): Eighteen reproductions of engraved gems of the eighteenth century in "Tassic pastes;" 12 plaster casts of engraved gems from the National Library, Paris. Purchase. 27151.
- TITUS, REV. H. R. (Vergennes, Vt.): Giant Water Bug, *Belostoma americanum*, Leidy. 27384.
- TODD, W. E. C. (Department of Agriculture): Four eggs and nest of Magnolia Warbler, and 4 eggs and nest of Kentucky Warbler, from Pennsylvania. 27361.
- TOWNSEND, C. H. (U. S. Fish Commission): Crayfishes from Loyalhanna Creek, Westmoreland County, Pa. Also an interesting collection of fishes, including specimens of *Notropis*, *Hypobsis*, *Rhinichthys*, *Etheostoma*, and other forms, from Westmoreland County. 27999.
- TOWNSEND, PROF. C. H. TYLER (curator, Institute of Jamaica, Kingston, Jamaica): Blind snake. 27583.
- TOWNSEND, DAVID (Bristol, Pa.): Medallic badge of the National Workingmen's Protective Tariff League, Washington, April 20-21, 1894. 28087.
- TRAPHAGEN, PROF. F. W. (See under G. F. Kellogg.)
- TREASURY DEPARTMENT (U. S. Coast and Geodetic Survey), through H. G. Ogden: Eleven Alaskan views. 27794.
- TRIPP, S. (Millerton, N. Y.): Three watches. Deposit. (Returned.) 27551.
- TRUJILLO, M. (See under Department of Agriculture.)

- TURNER, H. W. (U. S. Geological Survey): Five rocks from California (27338); rocks (27589); rocks and ores (27700); gold ore from Yellowstone gold quartz mine, Bear Valley, Mariposa County (27701); Tertiary fossils from San Francisco, and Cretaceous fossils from various localities in California (27754); rocks from California (27783); rocks and Jurassic fossils, *Aucella Erringtoni*, and Belemnites from the Mariposa beds of California (27802); Carboniferous and Mesozoic fossils from various Californian localities, and also a collection of fossil leaves (27812). (See under Interior Department, U. S. Geological Survey.)
- TURNER, L. M. (Seattle, Wash.): Two skins, nest, and 6 eggs of Oregon Chickadee, *Parus atricapillus occidentalis*, and skin, nest, and 4 eggs of Warbling vireo, *Vireo gilvus*. 28297.
- TUTTLE, DR. JAY (Astoria, Oreg.): Specimens of *Trichodon Stelleri*, from the Columbia River. 27316.
- ULKE, TITUS (Washington, D. C.): Rutile from the District of Columbia, molybdenite from Tilly Foster Mine, and teeth of a bear from Gailenreuth Cave, Germany (27948); specimen of cassiterite from Cash Mine, near Vesuvius, Rockbridge County, Va. (28157).
- UPHAM, E. P. (U. S. National Museum): Two leaf-shaped implements of quartzite from Lakeland, Md. (27487); leaf-shaped implement of quartz and 95 arrow-heads of quartz, quartzite, etc., from the Virginia side of the Potomac River, near Washington (27623); 8 rude quartzite implements from near Piney Branch (28184).
- URUGUAY (exhibit at the World's Columbian Exposition): Medal. Presented to Smithsonian Institution and transferred to the National Museum. 27727.
- USABURO OTSUKA (Osaka, Japan), through Prof. F. W. Clarke: Fireworks, with the gun used for projecting rockets, etc., from the World's Columbian Exposition. 27835.
- VAN DEMAN, H. E. (Parksley, Va.): Two specimens of *Venus mercenaria* from Cape Charles, Va. 27386.
- VAIL, MRS. AMANDA (deceased): Portrait of the late Alfred Vail, bequeathed to the Smithsonian Institution and transferred to the National Museum. 28226.
- VAN DEN BURGH, J. (Los Gatos, Cal.): Two eggs (1 set) of California Jay, 4 eggs (1 set) of Arkansas Goldfinch, 2 eggs (1 set) of California Thrasher (all very interesting specimens, albinos, and almost unspotted). 27821.
- VELIK, DR. J. W. (St. Joseph, Mich.): Specimens of *Cambarus virilis*, Hagen and *Cambarus propinquus*, Girard, 2 shells, *Limnæa stagnalis*, L. and *Physa lordi*, Baird, from northern Michigan (28065); skin of Ruby-crowned Kinglet, *Regulus calendula* (28305).
- VERY, CHARLES F. (New Albany, Ind.): Pressed plants, from Edmonson County, Ky. 27211.
- VIRGINIA, STATE COMMISSION OF, TO THE WORLD'S COLUMBIAN EXPOSITION, through Dr. John S. Apperson, executive commissioner: Stalagmitic marble, zinc and manganese ores, and ochers, from the State exhibit at the World's Columbian Exposition. 27882.
- VON IHERING, DR. H. (Museo Paulista, São Paulo, Brazil): Fresh-water shells from Brazil. 28263.
- VON ROSENBERG, LEO. (See under Interior Department, U. S. Geological Survey.)
- WALKER, BRYANT (Detroit, Mich.): Specimens of Unionidæ. 27501.
- WALKER, C. H. (Forestville, Md.): Grooved stone ax, from Prince George County. 27296.
- WALKER, HUGH S. (Waterford, Va.): Leaf-shaped arrow-head, from Loudoun County. 27332.
- WALKER, Hon. L. J. (See under Capt. John Rutter.)
- WALCOTT, Hon. CHARLES D. (See under T. Nelson Dale; Department of Mines and Agriculture, New South Wales; and Bernard Lundgren.)
- WALLACE, Mrs. CATHERINE P. (Melbourne, Australia): Human cranium with lower jaw, obtained from the Rubiani tribe, Solomon Islands. (Transferred to the Army Medical Museum.) 27726.
- WALLACE, Hon. G. H. (U. S. consul, Melbourne, Australia): Photograph of Australian canoes containing natives. 27201.
- WAR DEPARTMENT. (For a statement regarding the collections made during the survey of the boundary between

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the United States and Mexico, see under Dr. Edgar A. Mearns, and under F. X. Holzner, entered under Smithsonian Institution, U. S. National Museum.)
- WARD'S NATURAL SCIENCE ESTABLISHMENT (Rochester, N. Y.): Skull of *Anomalurus*, and skeletons of *Graphiurus*. Purchase. 27374.
- WARD, Prof. L. F. (See under F. W. Pettigrew.)
- WARD, R. G. (See under South Carolina railway exhibit at the World's Columbian Exposition.)
- WARENZOW, PIERRE A. (Nertschinsk, Siberia): Twenty-five species of Carabid beetles, and a collection of unmounted East Siberian beetles. Exchange. (27241, 27248.)
- WARNER, J. S. (Bramwell, W. Va.): Ninety-eight stone implements from Green County, Tenn. 27153.
- WASHINGTON MEMORIAL ARCH COMMITTEE, through H. G. Marquand, chairman: Two copies, in bronze, of the St. Gaudens medal commemorative of the Washington Memorial Arch in New York City. 28178.
- WATSON, W. A. (Washington, D. C.): Silicified bone from Garden Park, Fremont County, Colo. 28039.
- WAYNE, ARTHUR T. (Waukeelah, Fla.): Florida Screech Owl, *Megascops asio floridanus*, and 2 specimens of Leconte's Sparrow, *Ammodramus lecontei*, from Florida and South Carolina. 28131. (See under John H. Starin.)
- WEBB, Dr. DE WITT (St. Augustine, Fla.): Rude chipped implement of quartzite, from the gravel drift, Long Island. 27968.
- WEBBER, MARK (Oakland, Cal.): Specimens of variscite. 27348, 27674.
- WEBSTER, F. B. (Hyde Park, Mass.): Mole, *Scalops aquaticus*. 27764.
- WEEDON, W. C. (Washington, D. C.): Varying Hare, *Lepus americanus*, from Maine. 28105.
- WEEKS, R. W. (Intervale, N. H.), through Randall M. Erving: Indian stone implement plowed up in Kearsage, N. H. Deposit. 27460.
- WELCH, JOHN (Mammoth Hot Springs, Wyo.), through Dr. Frank Baker: Ore from Cooke City, Mont. 27443.
- WELD, FRANKLIN (Norfolk, Va.), through Mr. Richard Rathbun: Bald Eagle, *Haliaeetus leucocephalus*, in the flesh. 27671.
- WELLS, J. G. (Grenada, West Indies), through George N. Lawrence: Grenada Turtle Dove, *Zenaida rubripes* (type specimen), and a type specimen of Grenada Pea Dove, *Engyptila Wellsii*. 27187.
- WELLS, JAMES M. (State commissioner of Idaho to World's Columbian Exposition): Lava, from the Idaho exhibit at the World's Columbian Exposition. 27898. (See under Edward Brisbin.)
- WENTWORTH, E. P. (Portland, Me.): Shells, from Damariscotta River, Newcastle, and Long Creek, Cape Elizabeth, Me. 27949.
- WESTMAN, CHARLES F. (Toronto, Ontario, Canada): Specimen of *Favosites epidermatus*, from Canada (28035); specimens of *Spherium fabale* and *Zonites fuliginosus*, from near Toronto (28143); 1 specimen each of *Caryocrinus ornatus* and *Meristina cylindrica* (28295).
- WETMORE, Dr. C. H. (Hilo, Hawaiian Islands): Hawaiian Kapa cloth. 27521.
- WHITE, Prof. J. C. (Morgantown, W. Va.): Drilled ceremonial object from Monongalia County. Deposit. 27425.
- WHITE, J. J. (Rock Lodge, Fla.): Stone implement or sinker (27653); marine shells, representing 8 species (27902); specimens and eggs of *Ampullaria caliginosa*, Roe (28016).
- WICKERSHAM, JAMES (Tacoma, Wash.): Specimen of jade, from Mogöüing, about 40 miles north of Bhamo on the Irrawaddy River. Deposit. 27636.
- WIDMANN, O. (Old Orchard, Mo.): Two nests and 6 eggs of Chestnut-sided Warbler, and a nest of the Hooded Warbler, from St. Louis. 27534.
- WILCOX, JAY (East Chatham, N. Y.): Jersey blue fowl. 28084.
- WILCOX, Dr. TIMOTHY E., U. S. A. (Fort Huachuca, Ariz.): Giant Owlet Moth, *Erebus odora* (27186); through Dr. E. A. Mearns, U. S. A., alcoholic specimens of insects, reptiles, and a bat (*Antrozous pallidus*) (27626).
- WILDMANN, Hon. ROUNSEVELLE (World's Columbian Exposition, Chicago, Ill.): Two tin "dumps" used as money in

- WILDMANN, HON. ROUNSEVELLE—cont'd.
the Malay Peninsula about 800 A. D.,
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- WILKINSON, J. B. (Yuma, Ariz.): Specimen of *Arethæa*, representing a new species. 27350.
- WILCOX, JOSEPH (Philadelphia Pa.): Four minerals. 27432.
- WILLETT, HENRY (Brighton, England), through Mrs. Zelia Nuttall and Miss Alice Fletcher: Two photographs of a teapoc of Wedgwood ware. 27964.
- WILLIAMS, F. H. (Greene, N. Y.): Canoe (27161); cast of a crinoid, a species of *Actinocrinus* (returned) (27696); fossils from the Chemung formation, consisting of *Schizopharia impressa*, *Stropheodonta perplana*, *Camarotoechia duplicata*, *Atrypa reticularis*, *Spirifera mesastrialis*, *Cyclonema multilira*, *Schizodus chemungensis*, *Leiopteria Sayi*, *Amnigenia catkillensis*, *Pterinea flabella* (?) (28048); fossil tooth, 13 specimens (17 species) of Hamilton and 4 specimens of Chemung terrane fossils, 145 arrow-heads, from Chenango County, N. Y. (28269).
- WILLIAMS, GEORGE H. (Baltimore, Md.): Two specimens of piedmontite, from Pine Mountain, Monterey, Pa. 28010.
- WILLIAMS, R. S. (Columbia Falls, Mont.): Skin and 4 eggs (1 set) of Shufeldt's Junco, *Junco hyemalis Shufeldti*, and a skin of Lutescent Warbler, *Helminthophila celata lutescens* (27270); through Maj. Charles Bendire, U. S. A., 11 birds' skins, representing 6 species, from Montana (27638).
- WILLIAMSON, W. L. (Browns River, Hobart, Tasmania): Flint implements, 119 marine shells, and a hermit-crab, from Tasmania. Exchange. 27457.
- WILLIS, MERRITT (West Farms, N. Y.): Stone muller from Brown County, Ky., polished hatchet from Westchester County, and tooth of a sperm whale on which are depicted ships, whales, and other objects (27163); 7 rude quartzite implements and 4 arrow-heads, from the banks of the James River, near Richmond, Va. (27678).
- WILLOBY, GEORGE H. (Franklin, Mass.): Seven watches (1 open-face gold watch and 6 open-face silver watches). Deposit. 27574.
- WILSON, B. J. (Central City, W. Va.): Clay from eastern Kentucky. 28257.
- WILSON, E. M. (Belfast, N. Y.): Eight fragments of pottery, from an earth-work in Allegany County, N. Y. 27262.
- WILSON, Col. JOHN M., U. S. A. (Washington, D. C.): Brick from the foundation of the chimney of Washington's birthplace, at Wakefield, Va. 28188.
- WILSON, THOMAS (U. S. National Museum): Flint chips, flakes, and debris, from the dump heaps of one of the quarry sites at Flint Ridge, Licking County, Ohio, dug from a hole 10 inches square and 14 inches deep (27435); stone implements from Mount Vernon, Va. (27816); leaf-shaped implements of quartzite, found *en cache* on the banks of the Watauga River, Carter County, Tenn. (27988); spear-heads of chalcidony from the valley of the Little Missouri, Pike County, southwestern Arkansas, found *en cache* (27989); chipped argillite implement from the Trenton gravels, New Jersey (27990); rude chipped implement, scraper, arrow-head, pestle, fragment of a steatite vessel, handle and 17 fragments of pottery from Blackstone Island, Potomac River (27991); fragments of pottery and a quartzite arrow-head, from the banks of Wicomico River, Md. (27992); 2 spear-heads, arrow-head, rude chipped implement, and 5 fragments of pottery, from Newtown, Va. (27993); archaeological objects from Cambodia, Indo-China (28009); archaeological objects consisting of nodules, cores, hammers, rude and leaf-shaped implements of flint from Flint Ridge, Ohio (28243); coins in gold, silver, and copper, ancient Roman, Bactrian, Indo-Scythian, and mediæval (46 gold) (28301). Deposit.
- WINKLEY, Rev. H. W. (Saco, Me.): Four specimens of *Strobilops virgo*, Pilsbry. 27933.
- WINTON, GEORGE B. (Nashville, Tenn.): Brown Thrasher, *Harporynchus rufus*, in the flesh, from Greenville. 27393.
- WOLTZ, GEORGE W. (United States National Museum): Bat (*Adelonyx terus fuscus*) (27566); Homing Pigeon (27687).

- WOMAN'S COLLEGE (Baltimore, Md.): Five cycad trunks. Deposit. 28139.
- WOOD, N. R. (U. S. National Museum): Blue heron (27305); 3 field mice, from Florida (28003). (See under Henry Boswell, and Edward S. Schmid.)
- WOODROW, E. R. (Columbus, Ohio): Photograph of head of moose. 27921.
- WOODRUFF, Dr. C. E., U. S. A. (Fort Assiniboine, Mont.): Fire drill, obtained from the Hupa Indians of California. 27953.
- WOOLMAN, LEWIS (Philadelphia, Pa.): Specimens of *Cecum* and *Melanopsis*, from an artesian well at Cape May, N. J. 27996.
- WOOSTER, A. F. (Norfolk, Conn.): Photograph of the first Emperor of Germany, and 5 foreign postage stamps (27514); photograph of the late Ludwig II, King of Bavaria (28232).
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- WRIGHT, Mrs. D. M. (Newark, N. J.): Photograph of Hon. Stevens Thomson Mason, the first governor of the State of Michigan. 27277.
- WYOMING, STATE COMMISSION OF, TO THE WORLD'S COLUMBIAN EXPOSITION, through H. E. Crain, commissioner: Epsom salts, alum, selenite, asbestos, stream and lode tin ore, and fossil concretions, from the State exhibit at the World's Columbian Exposition. 27881.
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Illinois, State Commission of, to the World's Columbian Exposition	27894
Imperial Geological Survey of Japan (ex- hibit at the World's Columbian Expositi- on)	27855
Interior Department (exhibit at the World's Columbian Exposition)	27833
Interior Department (U. S. Geological Sur- vey)	27759, 27946, 27947
Jervis, G.	27497
Johnson Asbestos Mining Company, Que- bec, Canada (exhibit at the World's Co- lumbian Exposition)	27887
Johore Commission to World's Columbian Exposition	27841
Kasai, Zunhaci (exhibit at the World's Co- lumbian Exposition)	27853
Keith, J. G. (exhibit at the World's Colum- bian Exposition)	27889
Kellogg, G. F. (exhibit at the World's Co- lumbian Exposition)	27865
Kessler, J. & F.	27544
Korean Commission to World's Columbian Exposition	27829
Langdale, J. W.	27326, 27588
Lee, W. P.	28214
Loeber, C. H.	27459
Lowrey, W. L.	27258
McDonald, A. F. (exhibit at the World's Columbian Exposition)	27875
McGuire, Dr. J. C.	27611
Macintosh, W. (exhibit at the World's Co- lumbian Exposition)	27888
Madell, A. (exhibit at the World's Colum- bian Exposition)	27899
Marskon, Philip A.	27173
Mazza, C. N.	27410

	Accession number.		Accession number.
Mearns, Dr. E. A., U. S. A.....	27444,	Schleitel, Viggo (exhibit at the World's Co-	
	27494, 27612, 27749, 27803	lumbian Exposition)	27866
Merrill, G. P.....	27255, 28235	Sioux Valley Stone Company, Jasper, Minn.	
Miller, A. W. (exhibit at the World's Colum-		(exhibit at the World's Columbian Expo-	
bian Exposition).....	27884	sition).....	27883
Miller, F. T.....	27688, 27725	Smith, T. J	27359
Mills, T. B. (exhibit at the World's Colum-		Snowden, R. R	27312
bian Exposition).....	27870	South Dakota, State Commission of, to the	
Moore, J. T.....	27708	World's Columbian Exposition	27893
Nack, Charles.....	27306	Sturtz, B.....	27495
New South Wales Commission to World's		Sumner, J. W	27721
Columbian Exposition	27864	Swedish Commission to World's Columbian	
Nelson, E. W.....	27607	Exposition	27867
New Pedrara Onyx Company (exhibit at		Talmage, Dr. J. E	27164
the World's Columbian Exposition)	27871	Turner, H. W.....	27338,
Packard, R. L.....	27339		27589, 27700, 27701, 27783, 27802
Payn, E. J.....	27352, 27438, 27596	Ulke, Titus	27948
Penfield, Prof. S. L	27343	Virginia, State Commission of, to the	
Pettigrew, F. W.....	27939	World's Columbian Exposition.....	27882
Price, R. J. L. (exhibit at the World's Co-		Welch, John	27443
lumbian Exposition)	27880	Wells, J. M. (exhibit at the World's Colum-	
Queensland Museum.....	27208	bian Exposition).....	27898
Ragsdale, G. H	27166	Wilson, B. J.....	28257
Sal Mountain Asbestos Company (exhibit at		Worsley, Robert	27450
the World's Columbian Exposition. 27545, 27847		Wyoming, State Commission of, to the	
Santa Clara County, Cal. (exhibit at the		World's Columbian Exposition.....	27881
World's Columbian Exposition).....	27877	York, W. F.....	27817

APPENDIX VII.

SPECIMENS SENT TO THE MUSEUM FOR EXAMINATION AND REPORT.¹

The Museum has always recognized the request of any person for the determination of such objects as he may choose to forward, so long as it is evident that his request is made with the sole desire of adding to his store of knowledge.

The material transmitted for determination consists principally of geological specimens, birds, and insects. As has been explained in another place, only a very small benefit accrues to the Museum from this branch of its work. The amount of time required at the hands of the curators for the examination of the material is very considerable. When valuable material is transmitted, its return is almost invariably asked for. Geological material is constantly being received for assay, but it is impossible for the Museum to undertake work of this kind for the public, having no adequate laboratory facilities. Qualitative determinations are made whenever practicable.

Of the 478 lots of material sent for examination during the year only about one in sixteen became an accession to the collections, and probably a fifth of those thus retained were purchased. About one-sixteenth of the total number of lots received were transmitted by persons residing outside the United States.

The following is a complete list of the senders of material for examination and report during the year ending June 30, 1894:

<p>ACTON, I. O., Salem, N. J.: Two insects. 2650 (X).</p>	<p>ARKANSAS INDUSTRIAL UNIVERSITY, Fayetteville, Ark., through Prof. S. E. Meek: Shells and fossils. (Returned.) 2460 (IX).</p>
<p>ALBRAND, L. M., Glenville, N. Y.: Fossil tooth of mammal. 2630 (XII).</p>	<p>ATKINS, Mrs. DESSIE, Eddy, N. Mex.: Pearl. 2359 (IX).</p>
<p>ALEXANDER, E. P., Georgetown, S. C.: Skin of snake; shells and seeds. 2391, 2624 (VI, IX, XV).</p>	<p>AYRES, T. F., Richland Center, Wis.: Archæological objects and newspaper clipping. (Returned.) 2457 (III).</p>
<p>AMERICAN MUSEUM OF NATURAL HISTORY, New York City: Birds' skins. (Returned.) 2296 (V-A).</p>	<p>BABBITT BROS., Flagstaff, Ariz.: Rock from Colorado Cañon. 2470 (27540) (XVII).</p>
<p>ANTHONY, A. W., San Diego, Cal.: Birds' skins from California, Oregon, Lower California, and Colorado. 2300, 2384, 2461, 2512, 2517, 2518 (V-A).</p>	<p>BACA, T. M., San Bernardino, Cal.: Mineral. (Returned.) 2385 (XVI).</p>

¹The first number accompanying the entries in this list is that assigned to sendings "for examination" on the Museum records. The number in Roman, in parentheses, indicates the department in the Museum to which the material was referred for examination and report. When such material is permanently retained, a number of another series is attached, and this in the present list is placed in parentheses between the two sets of numbers already referred to.

- BAILEY, J. A., Navy-Yard, Washington, D. C.: Insect. 2392 (X).
- BAKER, C. L., Dayton, Ohio: Fragments of rock. 2735 (XVII).
- BAKER, G. C., Richmond, Tex.: Egg of fish. (Returned.) 2330 (VII).
- BAKER, JASPER, Bardstown, Ark.: Coin. 2581 (I).
- BAKER, J. H., Waldens Creek, Tenn., through Hon. J. C. Houk, M. C.: Ore. 2407 (XVII).
- BALDWIN, Mrs. MYRA. (See under H. Stephens.)
- BALL, THOMAS. (See under S. L. Chilson.)
- BARBER, A. P., Homer, La.: Ourang-outang. 2469 (27787) (IV).
- BARRETT, R. O., Pinos Altos, N. Mex.: Mineral. 2696 (XVI).
- BATEMAN, I. F., Easton, Md.: Branch of a tree with fruit attached, fruit of tree, and beans from the seed of the ripened fruit. 2376 (XV).
- BAUMEL, PAUL, Portland, Oreg.: Rock with piece of metal attached. 2467 (XVII).
- BAUR, Dr. G., University of Chicago, Chicago, Ill.: Three birds' skins. 2682 (28878) (XII).
- BEARDSLEE, Commander L. A., U. S. N., Naval Station, Port Royal, S. C.: Coral (?). (Returned.) 2648 (XI).
- BEEHAN, F. L., Waukon, Iowa: Leaf of grass with abnormal growth. 2323 (XV).
- BELL, ARCHIE, Geneva, Ohio: Plant. 2419 (XV).
- BELLOWS, A. R., Gloversville, N. Y.: Ore. (Returned.) 2368. (XVII).
- BERRY, E. W., Passaic, N. J.: Insects and water fleas. 2729 (X, XI).
- BIEDERMAN, C. R., Bonito, N. Mex.: Stone implement; mineral; 3 specimens of ores. 2313, 2390 (III, XVI, XVII).
- BIRD, S. M., Galveston, Tex.: Twenty-four ancient coins. 2585 (28805) (I).
- BISHOP, JOSEPH, Hollister, Cal.: Ore. 2564 (XVII).
- BOARDMAN, G. A., Calais, Me.: Bird. (Returned.) 2441 (V-A).
- BOMBERGER, J. H., Columbiana, Ohio: Insects. 2410 (X).
- BOND, W. P., Custer, S. Dak.: Ore. 2334 (XVII).
- BORDWINE, J. H., Greendale, Va.: Mineral. 2542 (XVI).
- BOYD, B. B., Hartington, Nebr.: Eggs of insects, taken from a cottonwood tree. 2547 (X).
- BOYD, G. W., Waynesboro, Tenn., through Hon. N. N. Cox: Phosphates. (Material turned over to Department of Agriculture.) 2608 (XVII).
- BRAEKINS, A. H., Bee Log, N. C.: Ore. 2357 (XVII).
- BRETT, WALTER, Lakeport, Cal.: Skins and skulls of mammals. (Returned.) 2500 (IV).
- BREWSTER, WILLIAM, Cambridge, Mass.: Birds' skins. (Returned.) 2550 (V-A).
- BRIMLEY, H. H. and C. S., Raleigh, N. C.: Snake and salamander (returned); lizards and toad from Texas; reptiles and batrachians (part returned and remainder retained). 2554, 2641, 2697 (VI).
- BRISBIN, EDWARD, Boise City, Idaho: Geological material; geodes; ores. 2569, 2662, 2725 (XVII).
- BROWN, C. H., Los Angeles, Cal.: Two leaves from trees or shrubs; eggs of an insect. 2520, 2664 (XV, X).
- BROWN, Dr. C. S., Columbia, Mo.: Flower. 2433 (XV).
- BROWN, C. S., Glass, Tenn.: Plant. 2749 (XV).
- BROWN, HERBERT, Tucson, Ariz.: Snake. 2435 (27539) (VI).
- BROWN, L. W., North Bristol, Ohio: Plaster cast of a shell (?). (Returned.) 2502 (XIII-A).
- BROWN, T. T., Euclid, Minn.: Supposed meteorite. (Returned.) 2622 (XVI).
- BROWNELL, C. L., Enterprise, Fla.: Plants. 2667 (XV).
- BROWNELL, C. S., Nyack on Hudson, N. Y.: Plants. 2358 (XV).
- BRUCE, H. W., Mangum, Tex.: Ore. (Returned.) 2425 (XVII).
- BUCK, Rev. D. S., Lepanto, Ark.: Small bone, 2 blue prints, and 3 photographs of pottery. 2636 (28170) (III).
- BUEHLER, U., county clerk Sank County, Wis., through professor of zoology, Madison, Wis.: Mammal scalps. 2756 (IV).
- BUGH, H. D., Standish, Mich.: Three stone relics. (Returned.) 2303 (III).
- BULLA, Mrs. J. W., Ashboro, N. C.: Ores. 2317 (XVII).
- BURNETT, JOHN, Needmore, N. C.: Minerals. 2332 (27246) (XVI).

- BUSTER, THOMAS C., Gibbonsville, Idaho: Root of herb. 2658 (I).
- BUTLER, M. F., Chester, Ark., through Hon. Hugh A. Dinsmore, M. C.: Supposed mineral. 2686 (XVI).
- BUTLER, S. S., Los Gatos, Cal.: Supposed meteorite. (Returned.) 2746 (XVI).
- CALHOUN, HUGH, Hot Springs, Ark.: Ore and pyrites. (Returned.) 2714 (XVII).
- CALL, Dr. S. J., Paso Robles, Cal.: Bird's skin. 2539 (27775) (V-A).
- CANNON, E. A. (See under Charles Croscan.)
- CAPWELL, V. L., Luzerne, Pa.: Ore. (Returned.) 2447 (XVII).
- CARPENTER, A. S., Trenton, N. Y.: Sand concretion. 2565 (27820) (XVII).
- CASEY, L. H., Bozeman, Mont.: Substance resembling clay. 2455 (XVII).
- CASTRO, Prof. CARLOS. (See under Salvador, National Museum of.)
- CATLETT, CHARLES, Staunton, Va.: Sandstone supposed to contain cast of a fossil. (Returned.) 2679 (XIII-A).
- CATLIN, J. C., Ravenna, Ohio: Water containing sediment from a geyser spring. 2398 (XVII).
- CHAMPION, T. E., San Francisco, Cal.: Rock. 2372 (XVII).
- CHAPMAN, F. M.: American Museum of Natural History, New York City: Birds' skins, from Trinidad and Guiana. (Returned.) 2711 (V-A).
- CHILSON, S. L., Santa Anna, Cal., through Thomas Ball: Two minerals. 2387 (XVI).
- CLARKE, A. W., Papillion, Nebr.: Plant. 2721 (XV).
- CLARKE, J. C., Golden, N. Mex.: Ore. (Returned.) 2501 (XVII).
- CLEMENS, G. W., Huntsdale, Mo.: Supposed meteoric stone. 2484 (XVI).
- COALE, H. K., Chicago, Ill.: Seven birds' skins from Texas and Arizona. 2572 (V-A).
- COBURN, L. S., Bangor, Me.: Supposed meteorite from South Dakota (returned); mineral. 2693, 2764 (XVI).
- COCKERELL, Prof. T. D. A., College of Agriculture, Las Cruces, N. Mex.: Reptiles and batrachians. (Returned.) 2629 (VI).
- COLLEY, T. P., Thayne, Wyo.: Two rocks; ore. (Returned.) 2698, 2722 (XVII).
- COMSTOCK, C. M., Deep River, Conn.: Copper beads. (Returned.) 2529 (III).
- CONYNGTON, THOMAS, Fort Worth, Tex.: Supposed asphalt from the Indian Territory. 2637 (28054) (XVII).
- COOPER & SHIELDS, Bright Hope, Tenn.: Ore. 2588, 2611 (XVII).
- CORNETT, H. B., Greenville, Ky.: Stone implement and 3 objects found in a burial mound. (Returned.) 2379 (III, XVI).
- COX, Hon. N. N. (See under G. W. Boyd.)
- COX, PHILIP, St. John, New Brunswick: Fish. (Returned.) 2361 (VII).
- COX, Prof. U. S., State Normal School, Mankato, Minn.: Birds' skins from Mexico. (Returned.) 2544 (V-A).
- CRAWFORD, Mrs. WILLIAM, Sparta, Wis.: One silver and 3 copper coins. (Returned.) 2466 (I).
- CROSCAN, CHARLES, Milwaukee, Wis.: Fungus growth, collected by E. A. Cannon. 2753 (XV).
- CUNNINGHAM, B. L., Fort Klamath, Ore.: Twenty-six butterflies (3 returned); insects (returned). 2442 (27447); 2602 (X).
- CURRY, Hon. J. L. M., Washington, D. C.: Rocks and ores. 2483 (XVII).
- CURTIS, J. E., Cle Elum, Wash.: Ore. 2668 (XVII).
- DALRYMPLE, Dr. E. S., Branchville, N. J.: Archaeological objects. (Returned.) 2617 (III).
- DANTAGNAN, J. D., New Orleans, La.: Fossil bone of mammal. (Returned.) 2355 (XII).
- DAVIS BROTHERS, Diamond, Ohio: Powder-horn. (Returned.) 2570 (II-A).
- DENNEEN, F. S., Fort Covington, N. Y.: Moth. 2293 (X).
- DENT, Dr. A. M., Coshocton, Ohio: Brass pipe. (Returned.) 2546 (III).
- DESERET MUSEUM, Salt Lake City, Utah through Dr. J. E. Talmage: Four spiders. 2406 (X).
- DETWILER, H. L., Watkins, Ore.: Ore. 2760 (XVII).
- DINSMORE, Hon. H. A., House of Representatives: Ore. (Returned.) 2382 (XVII). (See under M. F. Butler.)
- DONOVAN, S. O., Shoshone, Idaho: Ores. 2623 (XVII).
- DORMAN, FRANK, Rye Patch, Nev.: Ore. (Returned.) 2366 (XVII).

- DORNBIRER, J. G., Marion, Ind.: Small inscribed tablet. (Returned.) 2375 (III).
- DORSEY, Mrs. G. W., Fremont, Nebr.: Insect. 2514 (X).
- DOUGHERTY, C. M., Dougherty Station, Cal., through L. E. Phillips: Fossil shells; petrified wood. 2311 (IX, XIV).
- DOWNNEY, P., Downeyville, Nev.: Stones. 2522 (XVII).
- DRESSLER, A. O., Oriental, Pa.: Crystals. 2527 (XVI).
- DUN, N. A., Montgomery, La.: Section of vertebra of mammal. 2418 (27453) (XII).
- DUTCHER, WILLIAM, New York City: Five birds' skins; bird's skin. (Returned.) 2444, 2661 (V-A).
- DYER, F. R., King City, Mo.: Insect. 2436 (X).
- EAKER, L. E. R., Toby, Pa.: Ore. (Returned.) 2736 (XVII).
- EASLEY, C. H., Henrietta, Tex.: Hair ball. 2534 (IV).
- EASTON, D. F., New York City: Substance resembling moss, from Pennsylvania. 2717 (XV).
- ENGEL, F. J., German, W. Va.: Lignite. 2642 (XVII).
- EVANS, CREED, Low Gap, N. C.: Ores. 2526 (XVII).
- EVEREST, M. L., Clayton, N. Y.: Fish. (Returned.) 2701 (VII).
- EWING, R. M., Franklin, Tenn.: Caterpillar of a moth. 2356 (X).
- FAIRFAX, THOMAS. (See under Dr. W. W. Parker.)
- FALLING, Dr. B. F., Myrtle Creek, Oreg.: Mineral. 2421 (XVI).
- FARRAR, C. D., Lockhart, S. C.: Fifteen specimens of minerals; 20 specimens of quartz. (Returned.) 2480, 2535 (XVI).
- FARRELL, CHARLES, Fort Steele, British Columbia: Ore. (Returned.) 2371 (XVII).
- FAWCETT, J. G., Rincon, Tex.: Sample of guano. (Sent to United States Department of Agriculture.) 2577.
- FISH COMMISSION, U. S., through Colonel McDonald, United States Commissioner: Collection of fresh-water shells, principally from East Tennessee and adjacent regions. (Duplicate specimens returned, and a set reserved for the Museum.) 2473 (28059) (IX).
- FISHER, J. H., Wellsville, N. Y.: Photograph of a fossil fish. (Returned.) 2443 (XII).
- FISHER, W. H., Baltimore, Md.: Squirrel; mounted white squirrel. (Returned.) 2504, 2528 (IV).
- FITZGERALD, WILLIAM, Lewiston, Ill.: Piece of flesh in process of transformation into adipocere. 2354 (27311) (XVI).
- FLEMING, J. R., Menno, Pa.: Two insects. 2579 (X).
- FLOOD BROS., Malden, Mass.: Coleoptera. (Returned.) 2401 (X).
- FOOTE, C. W., North Muskegon, Mich.: Worm or insect. 2381 (X).
- FORESTER, S. N., Norcross, Ga.: Supposed meteoric iron. 2314; 2704 (returned) (XVI).
- FORRESTER, ROBERT, Castle Gate, Utah: Fossils (returned); fossil shells. 2298, 2491 (XIII-B).
- FORSYTH, W. J., Tuxtla Guterrez, Chiapa, Mexico: Coffee leaves. 2683 (XV).
- FOSTER, JAMES, Silver Cliff, Colo.: Ore. (Returned.) 2347 (XVII).
- FOX, M. MCK., Houston, Tex.: Two copper implements from Wisconsin. 2742 (III).
- FRANSHAM, C. F., Bozeman, Mont.: Rock. 2344 (XVII).
- FROELICH, H. G., Kansas City, Kans.: Button dug from 5 feet under ground, on the banks of the Missouri River. (Returned.) 2364 (I).
- FROST, S. E., Haskell, Tex.: Mineral. 2351 (XVI).
- FRY, E. M., Rinkerton, Va.: Ore. 2369 (XVII).
- GAFFNEY, J. P., Cumberland, Md.: Grubs found in a mountain spring. 2318 (X).
- GAULT, Dr. B. T., Glenellyn, Ill.: Birds' skins. (Returned.) 2748 (V-A)
- GILBERT, Prof. C. H., Leland Stanford Junior University, Palo Alto, Cal.: Reptiles and batrachians; lizards; crab. 2078 (27733, portion retained and remainder returned); 2719 (returned); 2751 (VI, XI).
- GILLRUP, W., Northwood, Iowa: Stone. 2481 (XVII).
- GLENN, H. L., Livingston, Mont: Rock. (Returned.) 2688 (XVII).
- GOODWILL, Minden, La.: Concretion. 2747 (XVII).

- GOODWIN, J. V., Selma, Ark.: Two small nuggets. 2448 (XVII).
- GORANSSON, C. E., Chicago, Ill.: Ticket of entrance to the lectures of "Archimedes." (Returned.) 2338 (I).
- GOSLIN, W. R., Salem, Md.: Arrow-head. (Returned.) 2694 (III).
- GOULD, C. C., Amesville, Ohio: Stone implement from a temple for sun worship in Braxton County, W. Va. 2329 (III).
- GRANT, J. W., Nogales, Ariz.: Chalk-like substance. 2474 (XVII).
- GRIFFIN, Miss O. B., Los Angeles, Cal.: Insect. 2438 (X).
- GROVER, W. E., Galveston, Tex.: Bird skin. (Returned.) 2513 (V-A).
- GUNNING, S. B., Lella, Tenn.: Insect. 2673 (X).
- GUTHRIE, R. E., Springfield, W. Va.: Wood. 2302 (I).
- HAHN, L. W., Silver Creek, N. Y.: Wood, with twig, leaves, and cone. 2757 (XV).
- HAIL, S. A., Batesville, Ark.: Cocoons from cedar tree. 2396 (X).
- HALL, J. W., Express, Oreg.: Stone. 2309 (XVII).
- HAMILTON & SPARKS, Roswell, N. Mex.: Stone. 2680 (28138) (XVII).
- HANCOCK, Dr. J. L., Chicago, Ill.: Bird-skin from Arizona. (Returned.) 2685 (V-A).
- HARDY, C. W., Cave Creek, Ariz.: Stones. 2465 (XVII).
- HARLOW, R. A., Helena, Mont.: Insect cases. 2360 (X).
- HARMON, WILLIAM, Red Lodge, Mont.: Ore. 2647 (XVII).
- HARPER, J. H., Dye, Tex.: Insect. 2307 (X).
- HARRIS, T. C. (See under State Museum, Raleigh, N. C.)
- HARTLE, E. C., Cle Elum, Wash.: Pulp. (Returned.) 2702 (XVI).
- HAYS, J. A. Boise City, Idaho: Two rocks. 2620 (XVII).
- HEDGES, HENRY, Douglas, Wash.: Minerals; stones; 9 minerals. 2324, 2587, 2708 (returned). (XVI, XVII, XVI.)
- HEDGES, THOMAS, Waterville, Wash.: Ore. 2649 (XVII).
- HEITMULLER, A., Washington, D. C.: Seventeen antique watches. (Returned.) 2738 (I).
- HENNING, C. F., Boone, Iowa: Tail feathers and leg of wild turkey. 2482 (V-A).
- HESTON, C. R., Sidney, Ohio: Archaeological object. (Returned.) 2524 (III).
- HEYMANN, S., Fayetteville, Tenn.: Mineral. 2628 (XVI).
- HIGHTOWER, Mrs. M. E., White Oaks, N. Mex.: Crystals. (Returned.) 2655 (XVI).
- HINCKLEY, Mrs. J. S., Telocaset, Oreg.: Ore. 2478 (XVII).
- HITCHCOCK, A. L., Los Angeles, Cal.: Black substance from an oil well. 2519 (XVII).
- HOADLEY, G. W., Phoenix, Ariz.: Black material resembling coal. 2705 (XVII).
- HODGE, H. G., York, Ill.: Plants. (Returned.) 2393 (XV).
- HODGSON, T. A. Y., Scranton, Pa.: Mineral. 2349 (XVI).
- HOFSTETTER, A. J., Santee, Cal.: Rock. 2657 (XVII).
- HOLLANDER, L., Salt Lake City, Utah: Seven ancient silver coins. (Returned.) 2476 (I).
- HOLLEY, J. T., Middlesboro, Ky.: Fossil bone. 2326 (XII).
- HOOD, H., Jewell Junction, Iowa: Mineral. 2449 (XVI).
- HOOPES, JOSIAH, West Chester, Pa.: Birds' skins from Arizona, Texas, California, Georgia; also from Texas and California. (Returned.) 2432, 2543, 2718, 2754 (V-A).
- HOPKINS, L. S., Lynchburg, Ohio: Stone implement; supposed meteorite. 2532, 2580 (III, XVI).
- HOUK, Hon. J. C. (See under J. H. Baker, and also under J. G. Lang.)
- HOUSTON, JOSEPH, Cumberland House, Saskatchewan, Northwest Territory: Mineral. 2333 (XVI).
- HOYT, D. Y., Lake Maitland, Fla.: Cuttings from a drill. (Returned.) 2343 (XVII).
- HOWARD, C. M., Deseret, Utah: Ore. (Returned.) 2510 (XVII).
- HOXIE, WALTER, Beaufort, S. C.: Bird-skin. (Returned.) 2559 (V-A).
- HUBARD, J. L., Colleen, Va.: Rock; ore. 2567, 2618 (XVII).
- HUBARD, P. A., Farmville, Va.: Ore. 2638 (XVII).

- HUBARD, R. T., Bolling, Va.: Mineral. 2295 (XVI).
- HUDGIN, W. G., Hinton, W. Va.: Brown stone. 2486 (XVII).
- HUGHES, EDWARD, San Francisco, Cal.: Two ear bones. (Returned.) 2656 (XII).
- HUME, J. M., Malott, Wash.: Mineral earth. 2440 (XVII).
- HUNTER, JOHN, Alexandria, Va.: Black substance. 2584 (XVII).
- HUNTINGTON, F. E., Bennett, Wyo.: Insect. (Returned.) 2475 (X).
- HUNTLEY, Mrs. M. J., Joliet, Mont.: Rock. 2363 (XVII).
- IMPERIAL SCIENCE COLLEGE, Imperial University, Tokio, Japan: Japanese reptiles and batrachians. 2515 (VI).
- IOWA, State University of, Iowa City, Iowa: Marine invertebrates. 2612. (Portion returned, and remainder retained. No. 28618).
- JACKSON, Miss EDITH, Minneapolis, Minn.: Marine invertebrates. (Returned.) 2503 (XI).
- JACKSON, J. W., Schaller, Iowa: Butterfly. 2427 (X).
- JESURUN, MORTIMER, Douglas, Wyo.: Birds' skins. (Returned.) 2417, 2604 (V-A).
- JEWETT, H. M. (See under Eugene Rodrigues.)
- JOHNSON, M. M., Oasis, Utah: Topaz crystals. 2370 (27366) (XVI).
- JONES, SAMUEL, Quanah, Tex.: Substance resembling chalk; ore. 2453, 2505 (XVII).
- JORDAN, G. D., Eddy, N. Mex.: Ore. 2322 (XVII).
- JUND, JOHN, Nogales, Ariz.: Supposed lithographic stone. 2388 (XVII).
- KAYSER, WILLIAM, Wapakoneta, Ohio: Insects. 2411 (27368) (X).
- KESSLER, D. D., West Newton, Pa.: Insect. 2431 (X).
- KINCAID, TREVOR, Olympia, Wash.: Clay. 2507 (XVI).
- KING, JESSE, Norristown, Pa.: Quartz and carbonate of lime. (Returned.) 2553 (XVI).
- KIRBY, D. M., Palatka, Fla.: Earth or mineral. 2365 (XVII).
- KNAB, FREDERICK, Chicopee, Mass.: Forty-six species of coleoptera. (Returned.) 2552 (X).
- KREBS, WILLIAM, Cleveland, Ohio: Manuscript relating to ancient chemistry. (Returned.) 2558 (I).
- KROUSE, P. L., Ruidoso, N. Mex.: Roots and herbs. 2395 (XV).
- KYLE, W. J., Gas City, Ind.: Fish. (Returned.) 2493 (VII).
- KOHN, G., New Orleans, La.: Two snakes from Louisiana and Florida. 2490 (VI).
- LANDER, W. T., Williamstown, S. C.: Mineral. 2468 (XVI).
- LANEY, H., Cumberland, Md.: Insect. 2321 (X).
- LANG, J. G., New Market, Tenn., through Hon. J. C. Houk, M. C.: Ore. (Returned.) 2422 (XVII).
- LANGE, C. T., Ortonville, Minn.: Rock. (Returned.) 2434 (XVII).
- LANGHEAD, FERDINAND, Olyphant, Pa.: Clay. 2459 (XVII).
- LARKIN, R. R., Las Cruces, N. Mex.: Two horned toads. (Returned.) 2692 (VI).
- LA TASTE, L. V., Montgomery, Ala.: Insect. 2408 (X).
- LAUGHLIN, J. M., Rockville, Mo.: Earth or mineral. 2497 (XVII).
- LEE, G. S., Chelsea, Ga.: Two specimens of minerals. 2454 (XVI).
- LELAND STANFORD JUNIOR UNIVERSITY, Palo Alto, Cal.: Lizards. (Returned.) 2676 (VI).
- LEMON, Dr. J. H., New Albany, Ind.: Insect. 2341 (X).
- LEWIS, G. A., Wickford, R. I.: Fishes. 2472 (VII).
- LEWIS, W. A., Red Lodge, Mont.: Plant. 2669 (XV).
- LEWMAN, WILLIAM, Escalante, Utah.: Fossils. 2745 XIII-B).
- LIBBY, C. M., Nashville, N. Y.: Plant or fungus. 2424 (XV).
- LINCOLN, B. M., Hartford, Conn.: Stone tablet. 2675 (III).
- LINNIGER, D. A., Wabash, Ohio, through U. S. Patent Office: Mineral. 2377 (XVI).
- LIVINGSTON, H. H., Savannah, Ga.: Fish. (Returned.) 2672 (VII).
- LÖNNBERG, Dr. EINAR, Upsala, Sweden: Reptiles from Florida. (Returned.) 2516, 2530 (VI).
- LOOMIS, L. M., Tryon, N. C.: Birds' skins from California. (Returned.) 2563 (V-A).

- LORD, D. D., Lawrence Station, N. Y.: Insect. 2761 (X).
 LOEBER, E. A., Yallaha, Fla.: Mineral. (Returned.) 2557 (XVI).
 LOWMAN, N. W., Monroe, Utah: Rock and sand. (Returned.) 2306 (XVII).
 LOWREY, W. L., Asheville, N. C.: Minerals; 2 specimens of ore. 2413, 2666 (XVI, XVII).
 LUND, A. C., Wenatchee, Wash.: Rocks. (Returned.) 2439 (XVII).
 LUNDY, C. A., & Co., Pomeroy, Wash.: Rock. 2758 (XVII).
 LUTHY, GODFREY G., Peoria, Ill.: Archaeological object. (Returned.) 2531 (III).
 LYFORD, Dr. W. H., Port Byron, Ill.: Tooth of mammal. (Returned.) 2488 (XII).
 LYLE, A. I., Malinda, Ga.: Minerals. 2383 (XVI).
 MCCARTHY, GERALD, Raleigh, N. C.: Isopod. 2463 (27582) (XI).
 MCCARTHY, JOHN, Hermosa, S. Dak.: Mineral; ore. 2380 (returned); 2715 (XVI, XVII).
 MCCLELLAND, C., Olympia, Wash.: Black sand. 2420 (XVII).
 MCCOY & HOULAHAN, through Hon. J. A. Pickler, Cripple Creek, Colo.: Rock. 2549 (XVII).
 McDONALD, Col. MARSHALL. (See under Fish Commission U. S.).
 MCFADDEN, J. E., Sterling, N. Y.: Insect. 2437 (X).
 MCFADIN, S. L., Logansport, Ind.: Skull of mammal. 2674 (28122) (XII).
 MCFARLANE, Miss LORENA, Minneapolis, Minn.: Insect. 2353 (X).
 MCGREGOR, R. C., Palo Alto, Cal.: Birds' skins from California and Colorado. (Returned.) 2644 (V-A).
 MCILWRAITH, F., Cairnbrae, Hamilton, Ontario: Bird-skin. (Returned.) 2509 (V-A).
 MCKENZIE, E. J., Meyersdale, Pa.: Ore. (Returned.) 2734 (XVII).
 MCKINLEY, C., Charleston, S. C.: Insect. 2707 (X).
 McNAB, J., Louisville, Ky.: Clay from Florida. 2712 (XVII).
 MCPHERSON, C. M., Pilot Point, Tex.: Insect. 2744 (X).
 MACKIE, S. F., Salt Lake City, Utah: Rock. 2654 (XVII).
 MACOUN, Prof. JOHN, Ottawa, Canada: Reptiles; fishes. (Portion returned.) 2663 (VI, VII).
 MAGILL, Dr. C. G. W., Catonsville, Md.: Twig of a tree. 2727 (XV).
 MAKARAINEN, M., Ferry, Wash.: Ore. (Returned.) 2614 (XVII).
 MALLORY, M. N., Baker City, Oreg.: Three specimens of minerals. (Returned.) 2601 (XVI).
 MANSFIELD, G. A., Ozark, Ark.: Supposed fang of rattlesnake. (Returned.) 2768 (VI).
 MAZZA, C. N., New York City: Stones and sample of powder made from the same. 2399 (27410) (XVII).
 MEEK, Prof. S. E. (See under Arkansas Industrial University).
 MEEKER, Dr. J. W., Nyack, N. Y.: Plants. 2316, 2327, 2409 (XV).
 MEENAN, NELLIE, Ridgway, Pa.: Insect. 2740 (X).
 MEUKE, H. W., Garden City, Kans.: Mammal skin. 2331 (27304) (IV).
 MYERS, MAX, Sheridan, Mont.: Minerals. (Returned.) (2633) (XVI).
 MILLEN, J. E., Stanton, Pa.: Ore; 2 specimens of rock. 2548, 2578 (one piece returned) (XVII).
 MILLER, E. G., Baltimore Md.: Seven Assyrian cylinders, and 2 seals. (Returned.) 2678 (I).
 MILLER, F. T., Lehi, Utah: Geological material. 2508 (27688) (XVII).
 MILLER, G. S., jr., Peterboro, N. Y.: Birds' skins, principally from Mexico. (Returned.) 2367 (V-A).
 MILLER, R. T., Fond du Lac, Minn.: Jaw, scales, and fragments of bones of a mammal. 2485 (28591) (IV).
 MILLER, W., Grand Rapids, Mich.: Unios. 2533 (IX).
 MINSTER, HARRY, Washington, D. C.: Mineral. 2319 (XVI).
 MITCHELL, L. C., Minneapolis, Minn.: Geological material. 2328 (XVII).
 MOORE, M. L., Pueblo, Colo.: Ore. 2575 (XVII).
 MOORE, M. S., Haselton, Ohio: Fossil fruit. 2336 (XIV).
 MORGAN, M. R., Acting Commissary-General of Subsistence, War Department, Washington, D. C.: Baking powder infested with larvæ. 2487 (X).

- MORRIS, R. O., Springfield, Mass.: Snake skin. (Returned.) 2378 (VI).
- MORROW, P. L., New Lisbon, Ohio: Insects. 2665 (X).
- MOYER, WILLARD, Bodines, Pa.: Substance resembling sand. 2589 (XVII).
- MYER, W. E., Carthage, Tenn.: Mound relics. 2456 (III).
- NANCE, Dr. W. V., Maybeury, W. Va.: Indian relic; 2 bogus stone vessels, supposed to be of prehistoric workmanship. (Returned.) 2545, 2621 (III).
- NEBRASKA, STATE UNIVERSITY OF, Lincoln, Nebr.: Fossils. 2551 (XIII-B).
- NEFF, GEORGE, Cardiff, Tenn.: Stone. 2540 (XVII).
- NELSON, ANTHONY, Boundary, Wash.: Ore. Transmitted for analysis. 2743 (XVII).
- NEWCOMER, S. E., Albuquerque, N. Mex.: Pair of Ute Indian saddlebags. Sent for examination with a view to purchase. (Returned.) 2643 (II-A).
- NEWLON, Dr. W. S., Oswego, Kans.: Fossil shells; Carboniferous fossil. (Returned.) 2346, 2659 (XIII-B; XIII-A).
- NEWTON, Prof. ALFRED, Magdalene College, Cambridge, Mass.: Birds' skins from Africa. 2681 (V-A).
- NORRIS, C. H., Salinas, Cal.: Two black stones. 2597 (XVII).
- NORTON, A. H., Westbrook, Me.: Skin of bald eagle. (Returned.) 2462 (V-A).
- NOYES, H. F., Satilla Bluff, Ga.: Worm from near a salt-water marsh. 2706 (28238) (X).
- NOYES, J. W., Scary, W. Va.: Mineral. 2525 (XVI).
- O'CONNOR, E. T., Eutaw, Ala.: Archaeological objects. (Returned.) 2631 (III).
- ORE, W. J., Mossy Creek, Tenn.: Insects. 2297 (X).
- OSMON, Mrs. LAURA E., Hillsboro, New Brunswick, Canada: Plant. 2340 (XV).
- PALMER, J. W., Washington, D. C.: Head of a fish embedded in a rockfish. 2345 (VII).
- PARK, Mrs. C. N., North Topeka, Kans.: Fossils. (Returned.) 2716 (XIII-A).
- PARKER, Dr. W. W., Philadelphia, Pa., through Thomas Fairfax: Fossil bone of mammal. 2325 (XII).
- PATCHELL, E. M., Gainesville, Tex.: Coin. 2590 (I).
- PATENT OFFICE, U. S. (See under D. A. Linniger.)
- PAYN, E. J., Olympia, Wash.: Rocks. 2592 (XVII).
- PEIRCE, Mrs. C. E., Compton, Cal.: Butterfly. 2416 (X).
- PENNIMAN, W. R., Asheville, N. C.: Iron ore. 2766 (XVI).
- PENNYPACKER, H. E., Tacoma, Wash.: Two specimens of rock in a crude state, and samples of the same prepared for use as an abrading material. 2561 (XVII).
- PENTZ, C. B., Walton, Kans.: Meteoric stone. (Returned.) 2414 (XVI).
- PETERS, H. G., Youngstown, Ohio. Insect. 2305 (X).
- PETERSEN, JOSEPH, North Castine, Me.: Chrysalis of a butterfly. 2352 (X).
- PETERSON, D., Lima, Mont.: Rocks. 2723 (XVII).
- PETERSON, HERMAN, Spring Grove, Minn.: Supposed meteoric stone. 2537 (XVI).
- PETICOLAS, C. L., Richmond, Va.: Plant. 2312 (XV).
- PETTEY, A. V., Shannon, Miss.: Scales of fish. 2689 (VII).
- PETTIT, Miss L. A., West Monroe, N. Y., through Mrs. Robert Shields: Butterfly. 2767 (X).
- PHILLIPS, F. M., Rosenberg, Tex.: Mineral. 2492 (XVI).
- PHILLIPS, L. E. (See under Charles M. Dougherty.)
- PICKLER, Hon. John A., M. C. (See under McCoy & Houlahan.)
- PINNEY, W. L., Phoenix, Ariz.: Insect. 2606 (X).
- PLEASANTS, J. HALL, Jr., Towson, Md.: Birds' skins. (Returned.) 2320 (V-A).
- POOLE, J. A., Richland, Mont.: Ores. 2477 (returned); 2615 (XVII).
- PORTER, J. E., Show Low, Ariz.: Fossil. (Returned.) 2605 (XIII-B).
- POWERS & JOHNSON, Vanderbilt, Cal.: Two specimens of ore. (Returned.) 2619 (XVII).
- QUICK, J. G., Coudersport, Pa.: Rock. 2576 (XVII).
- RAGSDALE, G. H., Gainesville, Tex.: Two specimens of supposed encrinite; supposed aerolite, and geological material. (Returned.) 2610 (XIV, XVI, XVII).

- RAMBO, M. E., Lower Providence, Md.: Two fossil teeth and fossil from the Bad Lands, South Dakota. 2568 (XII, XIII-B).
- RAMMELMEYER, ERNST, Lakeview, Idaho: Ores. (Returned.) 2310 (XVII).
- RANKIN, W. N., Princeton, N. J.: Crabs from the Bahamas. (Returned.) 2737 (XI).
- REED, ISAAC, Bellevue, Idaho: Ore. (Returned.) 2594 (XVII).
- REED, JOSEPH, keeper, Island Beach Life-Saving Station, Seaside Park, N. J.: Crab. 2445 (27467) (XI).
- REID, J. A., Bolling, Ala.: Insect. 2536 (27776) (X).
- REMICK, A. B., Taylorsville, Cal.: Minerals. (Returned.) 2652 (XVI).
- ROBINSON, Lieut. WIRT, U. S. A., Fort McPherson, Atlanta, Ga.: Birds' skins. 2299 (1 returned, and 3 retained 27331) (V-A).
- RODIGAS, EUGENE, Sivas, Turkey, through H. M. Jewett.: Plants from Asia Minor. 2458 (27562) (XV).
- ROGERS, THOMAS, McMinnville, Oreg.: Supposed ancient medal. 2339 (I).
- ROLLE, HERMANN, Berlin, Prussia: Shells. 2291 (portion purchased and recorded under Dr. and Mrs. L. T. Chamberlain, No. 27165). (Remainder returned.) (IX.)
- ROTHROCK, Dr. THOMAS, Howard, Pa.: Fossil. 2759 (XIII-A).
- ROWELL, G. P., New York City: Leaves of a plant. 2428 (XV).
- ROWLAND, Mrs. M. B., Round Lake, Miss.: Hair ball; insects; supposed trilobites. (Returned.) 2640 (IV, X, XIII-A).
- RUDOLPH, A. W., Altoona, Pa.: Two plants. 2720 (XV).
- RUNDELL, C. F., Canton, Pa.: Fruit. 2342. (Sent to Department of Agriculture.)
- SALISBURY, CHARLES, Reinbeck, Iowa: Wing of a bird. 2308 (V-A).
- SALVADOR, NATIONAL MUSEUM OF through Prof. Carlos Castro: Twenty one birds' skins (20 species). 2362 (portion retained 27301) V-A).
- SAUNDERS, W. E., London, Ontario, Canada: Three birds' skins. (Returned.) 2660 (V-A).
- SAYRE, S. B., Elizabeth, W. Va.: Mineral substance. 2495 (XVI).
- SCHENCK, A. E., Hughes, Ohio: Insect. 2337 (X).
- SCHLARBBAUM, PAUL, Loveland, Colo.: Two insects. 2651 (28254) (X).
- SCOTT, A. W., Clay City, Ky.: Fossil fish. 2452 (VIII).
- SCOTT, O. C., Oskaloosa, Iowa. Plants. 2294 (XV).
- SEARS & CO., New York City: Stone and aluminium. 2446 (XVII).
- SEITZ, A. S., Bushnell, Fla.: Worm. 2430 (X).
- SHEAFFER, S. G., Ness City, Kans.: Archaeological objects. (Returned.) 2741 (III).
- SHIELDS, Mrs. ROBERT. (See under Miss L. A. Pettit.)
- SHIPLEY, JOHN, Pilot Point, Tex.: Tooth of mammal. (Returned.) 2562 (XII).
- SHOCKLEY, H. M., Pablo Beach, Fla.: White substance. 2574 (XV).
- SHOENFELT, J. B., Douglas, Wyo.: Rock. 2573 (XVII).
- SHREVE, H. B., Independence, Mont.: Two specimens of ores. (Returned.) 2350 (XVII).
- SHRIVER, HOWARD, Cumberland, Md.: Rock; Fossils; geological material; fossils. 2304 (2506, two specimens retained No. 27790); 2593 (2616 returned); (portion of 2726 returned) (2750 returned). (XVII, XIII-A, XVII, XIII-A).
- SHOTWELL, A. D., Somerset, Ky.: Slate and ore. 2690 (XVII).
- SIEVERS, C. J., New Albany, Ind.: Substance resembling sand. (Returned.) 2598 (XVII).
- SIGERSON, ANDREW, Doylestown, Wis.: Ore. 2684 (XVII).
- SIMM, JOHN, Terraville, S. Dak.: Fire clay. (Returned.) 2677 (XVII).
- SISK, C. T., Whittier, N. C.: Two pieces of mammal bone. 2700 (XII).
- SISTRUNK, J. E., Jacksonville, Fla.: Ore. (Returned.) 2687 (XVII).
- SLANE, L. A., Oklahoma: *Gordius* sp. 2625 (28045) (XI).
- SLARGARDTER, L., Washington, D. C.: Mineral. (Returned.) 2627 (XVI).
- SMITH, D. B., Clarksfield, Ohio: Insect. 2752 (X).

- SMITH, HARLAN I., Saginaw, Mich.: Plant; coal plants, coal. 2494, 2595 (XV, XIV, XVII).
- SMITH, J. B., Delta, Colo.: Mineral. 2412 (XVI).
- SMITH, WINFIELD, Parkersburg, W. Va.: Minerals. (Returned.) 2607 (XVI).
- SNYDER, H. C., Salt Lake City, Utah: Ore. (Returned.) 2646 (XVII).
- SNYDER, W. E., Beaver Dam, Wis.: Beetles and specimen of diptera. (Returned.) 2400 (X).
- SÖLSNESS, LARS P., Dazey, N. Dak.: Brass vial supposed to contain poison, from a burial mound in Denmark. (Returned.) 2671 (III).
- SOMERS, JOHN, Roslyn, Wash.: Sand. 2653 (XVII).
- SOUTHWICK, W. C., Raritan, N. J.: Bird-skin. (Returned.) 2713 (V-A).
- SPRINKEL, J. W., Dulinsville, Va.: Caterpillar. 2374 (X).
- SQUYER, HOMER, Mingusville, Mont.: Cretaceous fossils. 2583 (27944) (XIII-B).
- STACK, W. P., Hinton, W. Va.: Ore. 2389 (XVII).
- STAHL, E., Prescott, Ariz.: Two stones. 2523 (XVII).
- STATE MUSEUM, Raleigh, N. C., through Thomas C. Harris, curator: Sand concretion. 2731 (XVII).
- STAUFFER, J. A., McKeesport, Pa.: Mineral. (Returned.) 2566 (XVI).
- STEARNS, FREDERICK, Detroit, Mich.: Cylinders and works of glyptic art; crabs and other marine invertebrates from Japan, Hawaiian Islands, and Loo-Choo; cylinders and specimens of glyptic art. 2541; 2555 (2 boxes of the specimens returned); 2586 (I, XI, I).
- STEERS, Mrs. MAGGIE, Wynne Wood, Ind. T.: Mineral. (Returned.) 2613 (XVI).
- STEINBERG, A. H., Joplin, Mo.: Wax impression of a silver piece. 2582 (I).
- STEPHAN, GEORGE, Delta, Colo.: Coin. (Returned.) 2426 (I).
- STEPHENS, H., Kokomo, Ind., through Mrs. Myra Baldwin: Sanskrit copy of the Buddha religion, with original illustrations. (Returned.) 2415 (I).
- STEVENSON, E., La Barge, Wyo.: Plants. 2739 (XV).
- STEWART, Dr. T. B., Lock Haven, Pa.: Stone implements, and a plaster cast of a stone implement. (Returned.) 2292 (III).
- STIMSON, C., Chantilly, Kans.: Sample of earth. 2599 (XVII). (Referred to Department of Agriculture.)
- STOCKDALE, T. B., Belle Vernon, Pa.: Fossil; objects from a mound. 2591 (returned); 2709 (XIII-A, III).
- STONE, WITMER, Academy of Natural Sciences, Philadelphia, Pa.: Two birds' skins; bird from Philippine Islands. (Returned.) 2511, 2691 (V-A).
- STOUFFER, JEREMIAH, Wooddale, Pa.: Piece of metal, ore, and metal. 2538, 2571 (XVII).
- STRATTAN, L. H., Tahlequah, Ind. T.: Three specimens of crushed rock. (Returned.) 2402 (XVII).
- STRICKLER, HENRY, Colorado Springs, Colo.: Supposed meteorite. 2464 (27995) (XVI).
- SUMMERS, C. L., Montgomery, W. Va.: Copper coin. 2724 (I).
- SWINT, W. B., Denver, Ga.: Ore. (Returned.) 2695 (XVII).
- TALMAGE, Dr. J. E. (See under Deseret Museum.)
- TAYLOR, A. V., Salt Lake City, Utah: Piece of supposed meteorite. (Returned.) 2596 (XVI).
- TAYLOR, E. L., Cave Creek, Ariz.: Supposed lithographic stone. 2699 (XVII).
- TAYLOR, G. C., Syracuse, N. Y.: Insect. 2703 (X).
- TAYLOR, R. V., Salt Lake City, Utah: Mineral. 2560 (XVI).
- TEUTE, F., Rochester, N. Y.: Forty-two species of butterflies. 2394 (X).
- THATCHER, G. L., River Forest, Ill.: Branch of a tree infested with parasites. 2733 (X).
- THE LONG ISLAND ARCHEOLOGICAL CLUB, Brooklyn, N. Y.: Photographs of drift implements. 2635 (28573) (III).
- THE TRAINING BACK STOOL COMPANY, Los Angeles, Cal.: Music stool with orthopedical appliances. 2763 (I).
- THICHOFF, J. H., Largo, N. Mex.: Ore. 2423 (XVII).
- THOMAS, C. D., Gloversville, N. Y.: Mineral. 2404 (XVI).
- THOMPSON, WILEY, Rusk, Tex.: Green sand. 2499 (XVI).

- TIBBITS, FRANK, Fort Smith, Ark.: Small collection of minerals. (Returned.) 2762 (XVI).
- TOMS, C. F., Hendersonville, N. C.: Two ancient coins. (Returned.) 2451 (I).
- TURNER, F. R., Denver, Colo.: Ore. 2397 (XVII).
- TUTTLE, W. A., Lyndonville, N. Y.: Brass implement. (Returned.) 2732 (III).
- VAUGHAN, P. S., Portsmouth, Va.: Butterfly. (Returned.) 2348 (X).
- VELIE, DR. J. W., St. Joseph, Mich.: Fishes; shells; crayfishes. 2626 (fishes returned); (shells and crayfishes retained No. 28065) (VII, IX, XII).
- VIDRINE, E. E., Ville Platte, La.: Root, supposed to be an antidote for the bite of a snake. 2603 (29295) (I).
- VINSON, C. E., Columbus Grove, Ohio: Insect. 2373 (X).
- VOGEL, A., Hastings, Nebr.: Eggs of an insect. 2632 (X).
- WARD'S NATURAL SCIENCE ESTABLISHMENT, Rochester, N. Y.: Mammal skins. 2521 (IV).
- WARREN, J. H., Oregon, Tenn.: Ore. (Returned.) 2556 (XVII).
- WATFIELD, FRANK, Red Lodge, Mont.; Minerals. 2335 (XVI).
- WATKINS, G. W., Moriah, N. Y.: Minerals. 2479 (XVI).
- WAYNE, A. T., Mount Pleasant, S. C.: Birds' skins from Florida. (Returned.) 2755 (V-A).
- WEAVER, L. C., Mooresburg, Pa.: Rocks. 2728 (XVII).
- WEBER, C. F., Philadelphia, Pa.: Insect. 2301 (X).
- WEST, C. W., Salt Lake City, Utah: Ore. 2710 (XVII).
- WESTMAN, C. F., Toronto, Ontario, Canada: Fossils. 2645 (returned); 2765 (returned except 2 specimens, No. 28295). (XIII-A).
- WHEELER, O. C., Redlands, Cal.: Insect. 2489 (X).
- WHITACRE, J. W., Levels, W. Va.: Ore. (Returned.) 2403 (XVII).
- WHITE, C. M., Cokeville, Wyo.: Ores. 2639 (XVII).
- WHITE, H., Manse, Nev.: Rock. 2471 (XVII).
- WILCOX, Miss NANNIE, Sunbury, Ohio: Book printed in 1792. (Returned.) 2429 (I).
- WILLIAMS, C. R., Washington, D. C.: Mineral. 2405 (XVI).
- WILLIS, OZIAS, Willis, Mont.: Mineral. 2386 (XVI).
- WILSON, Hon. JOHN L., M. C., House of Representatives: Supposed kaolin. 2670 (XVII).
- WILSON, W. S., Harrisburg, Ariz.: Ore. 2609 (XVII).
- WOLCOTT, J. H., Glencoe, Nev.: Asbestos. 2315 (XVI).
- WORTHEN, C. K., Warsaw, Ill.: Mammal skins and skulls; bats and shrews; mammal skins and skulls; 2450 (3 specimens retained, 27524; the others returned); 2498; 2634 (28795) (IV).
- WRIGHT, FREDERICK, Madison, Nebr.: Supposed meteor. (Returned.) 2496 (XVI).
- YOUNT, S. C., Keystone, Nev.: Rock. 2730 (XVII).
- ZERFALL, HENRY, Laurelville, Pa.: Metal. (Returned.) 2600 (XVII).
- ZOOLOGY, PROFESSOR OF, State University, Madison, Wis. (See under A. Buehler.)

Index to list of specimens sent for examination and report, arranged geographically.

Source	Number of lot.	Total.
North America:		
British America	2333, 2340, 2361, 2371, 2509, 2645, 2660, 2663, 2765	9
Central America	2361	1
Mexico	2300, 2318, 2461, 2512, 2518, 2544, 2683	7
United States:		
Alabama	2408, 2448, 2536, 2631	4
Arizona	2338, 2432, 2435, 2465, 2474, 2523, 2572, 2605, 2606, 2609, 2685, 2699, 2705	13
Arkansas	2396, 2460, 2581, 2636, 2686, 2714, 2762, 2768	8
California	2311, 2372, 2384, 2385, 2387, 2416, 2438, 2461, 2489, 2500, 2517, 2518, 2519, 2520, 2539, 2563, 2564, 2597, 2619, 2644, 2652, 2656, 2657, 2664, 2676, 2718, 2719, 2746, 2751, 2754, 2763	31
Colorado	2347, 2384, 2397, 2412, 2426, 2464, 2470, 2549, 2575, 2644, 2651	11
Connecticut	2529, 2675	2
District of Columbia	2319, 2345, 2382, 2392, 2405, 2483, 2487, 2627, 2670	9
Florida	2343, 2365, 2430, 2516, 2530, 2557, 2574, 2667, 2687, 2712, 2755	11
Georgia	2299, 2314, 2383, 2454, 2672, 2695, 2704, 2706, 2718	9
Idaho	2310, 2569, 2594, 2620, 2623, 2658, 2662, 2725	8
Illinois	2338, 2354, 2393, 2450, 2488, 2498, 2531, 2634, 2682, 2733, 2748	11
Indiana	2341, 2375, 2393, 2415, 2598, 2674	6
Indian Territory	2402, 2613	2
Iowa	2294, 2308, 2323, 2427, 2449, 2481, 2482	7
Kansas	2331, 2346, 2364, 2414, 2599, 2659, 2716, 2741	8
Kentucky	2326, 2379, 2452, 2690	4
Louisiana	2355, 2418, 2469, 2490, 2603, 2747	6
Maine	2353, 2441, 2462, 2764	4
Maryland	2304, 2318, 2320, 2321, 2376, 2504, 2506, 2528, 2593, 2616, 2678, 2694, 2726, 2727, 2750	15
Massachusetts	2378, 2401, 2550, 2552	4
Michigan	2303, 2381, 2494, 2533, 2541, 2586, 2595, 2626	8
Minnesota	2328, 2353, 2434, 2485, 2503, 2537, 2622	7
Mississippi	2640, 2689	2
Missouri	2433, 2436, 2484, 2497, 2582	5
Montana	2335, 2344, 2350, 2360, 2363, 2386, 2455, 2477, 2583, 2615, 2647, 2633, 2669, 2688, 2723	15
Nebraska	2496, 2514, 2547, 2551, 2632, 2721	6
Nevada	2315, 2366, 2471, 2522, 2730	5
New Jersey	2445, 2617, 2650, 2713, 2729	5
New Mexico	2313, 2322, 2359, 2390, 2395, 2423, 2461, 2501, 2629, 2643, 2655, 2680, 2692, 2696	14
New York	2293, 2296, 2316, 2327, 2358, 2367, 2368, 2394, 2399, 2404, 2409, 2424, 2428, 2437, 2443, 2444, 2446, 2479, 2521, 2565, 2630, 2635, 2661, 2701, 2703, 2717, 2732, 2738, 2757, 2761, 2767	31
North Carolina	2317, 2332, 2357, 2413, 2451, 2463, 2526, 2554, 2666, 2697, 2700, 2731, 2766	13
Ohio	2305, 2336, 2337, 2373, 2377, 2398, 2410, 2411, 2419, 2429, 2502, 2524, 2532, 2546, 2558, 2570, 2580, 2665, 2735, 2752	20
Oklahoma	2625	1
Oregon	2309, 2339, 2421, 2442, 2461, 2467, 2478, 2601, 2602, 2760	10
Pennsylvania	2292, 2301, 2325, 2340, 2349, 2431, 2447, 2459, 2511, 2527, 2538, 2548, 2553, 2566, 2571, 2576, 2578, 2579, 2589, 2591, 2600, 2709, 2720, 2728, 2734, 2736, 2740, 2759	28
Rhode Island	2472	1
South Carolina	2391, 2468, 2480, 2535, 2559, 2624, 2648, 2707	8
South Dakota	2384, 2380, 2568, 2677, 2693	5

Index to list of specimens sent for examination and report, etc.—continued.

Sources.	Number of lot.	Total.
United States—Continued.		
Tennessee	2297, 2356, 2407, 2422, 2456, 2473, 2540, 2556, 2588, 2608, 2611, 2628, 2673, 2715, 2749.	15
Texas	2307, 2330, 2351, 2425, 2453, 2492, 2499, 2505, 2513, 2534, 2543, 2562, 2572, 2577, 2585, 2590, 2610, 2637, 2641, 2744, 2754.	21
Utah	2298, 2306, 2370, 2406, 2476, 2491, 2508, 2510, 2560, 2596, 2646, 2654, 2710, 2745.	14
Virginia	2295, 2312, 2348, 2369, 2374, 2542, 2576, 2584, 2618, 2638, 2679	11
Washington	2324, 2420, 2439, 2440, 2507, 2561, 2587, 2592, 2614, 2649, 2653, 2668, 2702, 2708, 2743, 2758.	16
West Virginia	2302, 2329, 2389, 2403, 2486, 2495, 2525, 2545, 2607, 2621, 2642, 2724	12
Wisconsin	2400, 2457, 2466, 2684, 2742, 2753, 2756	7
Wyoming	2417, 2475, 2573, 2604, 2639, 2698, 2722, 2739	8
West Indies	2612, 2711, 2737	3
South America	2711	1
Europe	2291, 2671	2
Asia	2515, 2555	2
Asia Minor	2458	1
Africa	2681	1
Oceania	2555, 2691	2

The number of "lots" referred to the various departments in the Museum for examination and report are indicated below:

Department.	Number of lots.
Arts and industries	25
Ethnology	2
Prehistoric anthropology	26
Mammals	13
Birds	41
Reptiles and batrachians	17
Fishes	10
Mollusks	8
Insects	61
Marine invertebrates	11
Comparative anatomy	14
Invertebrate fossils:	
Paleozoic	14
Mesozoic	8
Fossil plants	4
Botany	32
Minerals	67
Geology	142

APPENDIX VIII.

BIBLIOGRAPHY OF THE U. S. NATIONAL MUSEUM FOR THE FISCAL YEAR ENDING JUNE 30, 1894.

(With lists of new genera, subgenera, and species.)

PUBLICATIONS OF THE MUSEUM.

ANNUAL REPORT.

Annual Report | of the | Board of Regents
| of the | Smithsonian Institution, |
showing | the Operations, Expendi-
tures, and Condition | of the Institution
| for the | year ending June 30, 1891.
| — | Report | of the | U. S. National
Museum. | — | Washington: | Gov-
ernment Printing Office. | 1892.

8vo, pp. i-xvii, 1-869, pls. I-LXXXIV, figs. 1-151, diagrams 1-3.

PROCEEDINGS.

Smithsonian Institution. | United States
National Museum. | — | Proceedings |
of the | United States National Mu-
seum. | — | Volume XV. | 1892. | — |
Published under the direction of the
Smithsonian Institution. | — | Wash-
ington: | Government Printing Office.
| 1893.

8vo, pp. i-vi, 1-508, pls. I-LXXXIV, figs. 1-5.

The dates of publication of the separate papers (Nos. 887-918) are given on page vi of the volume.

Smithsonian Institution. | United States
National Museum. | — | Proceedings |
of the | United States National Mu-
seum. | — | Volume XVI. | 1893. | — |
Published under the direction of the
Smithsonian Institution. | — | Wash-
ington: | Government Printing Office.
| 1894.

8vo, pp. i-x, 1-808, pls. I-LXXXIV, figs. 1-13.

The dates of publication of the separate papers (Nos. 919-975) are given on page x of the volume.

The following papers from Volume XVII have been published in separate form during the fiscal year covered by this Report: Nos. 976, 977, 978, 979, and 980; also advance sheets of Nos. 986, 999, and 1006.

BULLETIN.

Smithsonian Institution. | United States
National Museum. | — | Bulletin | of
the | United States National Museum.
| No. 43. | A Monograph of the Bats of
North America. | By | Harrison Allen,
M. D. | — | Washington: | Govern-
ment Printing Office. | 1893.

8vo, pp. i-ix, 1-198, pls. I-XXXVIII.

Smithsonian Institution. | United States
National Museum. | — | Bulletin | of
the | United States National Museum.
| No. 44. | Catalogue of the Lepidop-
terous Superfamily | Noctuidæ found
in Boreal America. | By | John B.
Smith, Sc. D., | Professor of Ento-
mology in Rutgers College. | — | Wash-
ington: | Government Printing Office.
| 1893.

8vo, pp. 1-424.

Smithsonian Institution. | United States
National Museum. | — | Bulletin | of
the | United States National Museum.
| No. 45. | Monograph of the North
American Proctotrypidæ. | By | Wil-
liam H. Ashmead. | — | Washing-
ton: | Government Printing Office. | 1893.

8vo, pp. 1-472, pls. I-XVIII.

Smithsonian Institution. | United States
National Museum. | — | Bulletin | of
the | United States National Museum.
| No. 46. | The Myriapoda of North
America. | By | Charles Harvey Boll-
man. | Edited by | L. M. Underwood.
| — | [Containing the collected writ-
ings on North American Myriapoda,
both published and | unpublished, of the
late C. H. Bollman.] | — | Washing-
ton: | Government Printing Office. | 1893.

8vo, pp. 1-210.

PAPERS BY OFFICERS OF THE MUSEUM AND OTHER INVESTIGATORS WHOSE WRITINGS ARE BASED DIRECTLY OR INDIRECTLY ON MUSEUM MATERIAL.

ABBOTT, W. L. Notes on the natural history of Aldabra, Assumption, and Gloriosa islands, Indian Ocean.

Proc. U. S. Nat. Mus., xvi, No. 973, February 9, 1894, pp. 759-764, fig. 1.

General natural history notes. Many of the mammals, birds, and insects referred to are represented in the Museum collection by specimens presented by Dr. Abbott.

ADLER, CYRUS. Museum collections to illustrate religious history and ceremonies.

Memoirs of the International Congress of Anthropology, Chicago, 1893, pp. 322-331.

— The Shofar, its use and origin.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1892 (1893), pp. 437-450, pls. xcvi-c.

Reprinted from the *Proceedings of the National Museum* (xvi, pp. 287-301).

— Report on the Section of Oriental Antiquities in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 147-148.

ALDRICH, TRUMAN H. New Tertiary fossils from Red Bluff, Mississippi.

Nautilus, vii, No. 9, January, 1894, pp. 97-99, pl. iv.

The following new species from the Eocene of Red Bluff are described: *Mitra lintoidea*, *Cyprea Dalli*, *Pleurotoma Clarkeana*, *Murex (Pteromotus) Burnsii*, *Cerithium serratoides*, *Latirus indistinctus*. With the exception of *P. Clarkeana*, the types are in the National Museum.

ALLEN, HARRISON. Smithsonian Institution. | United States National Museum. | - | Bulletin | of the | United States National Museum. | No. 43. | A Monograph of the Bats of North America. | By | Harrison Allen, M. D. | - | Washington: | Government Printing Office. | 1893.

8vo., pp. i-ix, 1-198, pls. i-xxxviii.

This work is essentially a second and revised edition of the "Monograph of North American Bats," published by the Smithsonian Institution in 1864 in its series of *Miscellaneous Collections*. It is much fuller than the original work, containing, besides descriptions of all the North American genera and species and other matter of a systematic character, notes on the skull and other parts of the skeleton, descriptions of the teeth, observations on variation and geographical distribution, and tables of measurements.

ALLEN, HARRISON—continued.

The illustrations include figures of the head, membranes, skull, and teeth of all the North American species.

In an appendix transcripts of the original descriptions of several species are given.

The introduction contains a brief survey of the external and anatomical characteristics of the whole order.

The work is based almost entirely on the collections of the National Museum.

ALLEN, JOEL ASAPH. On a collection of birds from Chapada, Matto-Grosso, Brazil, made by Mr. H. H. Smith. Part III. Pipridæ to Rheidæ.

Bull. Am. Mus. Nat. Hist., v, July, 1893, pp. 107-152.

One hundred and ninety-three species are treated, on some of which critical notes are given. *Pygmornis chapadensis*, from Chapada, and *Buteo albicaudatus Sennetti*, from Lower Rio Grande, Texas, are described as new. *Piaya cayana Cabanisi* is proposed as a new name for *Pyrrhococcyx macrourus* Cab.

This paper is based partly upon Museum material.

American Ornithologists' Union. Sixth supplement to the American Ornithologists' Union Check-list of North American birds.

Auk, xi, January, 1894, pp. 46-51.

In this supplement six additions are made to the list of North American birds by the committee on nomenclature appointed by the American Ornithologists' Union, three candidates for admission are rejected, and action is deferred regarding five others. Proposed revisions of nomenclature, affecting one generic and four subspecific names, are discussed. The committee has made use of Museum material in connection with its work.

ASHMEAD, WILLIAM H. Smithsonian Institution. | United States National Museum. | - | Bulletin | of the | United States National Museum. | No. 45. | Monograph of the North American Proctotrypidæ. | By | William H. Ashmead. | - | Washington: | Government Printing Office. | 1893.

8vo., pp. 1-472, pls. i-xviii.

This work is based largely upon Museum material.

The new genera and species described are enumerated in the lists following the Bibliography.

BEAN, BARTON A. Notes on William-son's Whitefish in breeding colors, from

BEAN, BARTON A.—continued.

Little Spokane River, Washington, and remarks on the distribution of the species.

Report of the Commissioner of Fish and Fisheries on Investigations in the Columbia River Basin, in regard to the Salmon Fisheries, Washington, 1894, pp. 55-56.

These notes are based upon Museum material.

BEAN, TARLETON H. Description of a new Blennioid fish from California.

Proc. U. S. Nat. Mus., xvi, No. 967, February 10, 1894, pp. 699-701.

Plagiogrammus Hopkinsii, new genus and species, collected at Monterey, Cal., June 22, 1893, by car No. 2 of the U. S. Fish Commission.

— Life history of the salmon.

Bull. U. S. Fish Com., xii, 1892 (1894), pp. 21-38.

— Bibliography of the Salmonidæ of Alaska and adjacent regions.

Bull. U. S. Fish Com., xii, 1892 (1894), pp. 39-49.

— Report on the Department of Fishes in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 219-221.

BENDIRE, CHARLES. An attractive addition to the avifauna of the United States.—*Icterus gularis yucatanensis*, von Berlepsch.

Auk, x, October, 1893, pp. 366-367.

An account of the capture in Louisiana of this species, which is new to the United States.

— A description of a new subspecies of Prairie Hen, *Tympanuchus americanus Attwateri*, Attwater's or Southern Prairie Hen.

Auk, ix, No. 2, April, 1894, pp. 130-132.

— Report on the Section of Birds' Eggs in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 213-214.

BENEDICT, JAMES E. Notice of the crustaceans collected by the United States Scientific Expedition to West Africa.

Proc. U. S. Nat. Mus., xvi, No. 949, October 6, 1893, pp. 535-541.

This list includes specimens collected at the Azores, Cape Verde, and Barbadoes islands, on the voyage to and from the west coast of Africa. The only new form is a variety (*gladiator*) of *Callinectes tumidus*.

BOEHMER, GEORGE H. Prehistoric naval architecture of the north of Europe.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 527-647, pls. LXVIII-LXXXIV, figs. 25-151.

BOLLMAN, CHARLES HARVEY. Smithsonian Institution. | United States National Museum. | - | Bulletin | of the | United States National Museum. | No. 46. | The Myriapoda of North America. | By | Charles Harvey Bollman. | Edited by | L. M. Underwood. | - | [Containing the collected writings on North American Myriapoda, both published and | unpublished, of the late C. H. Bollman.] | - | Washington: | Government Printing Office. | 1893.

8vo., pp. 1-210.

This work is based partly upon Museum material. The new genera and species described are enumerated in the lists following the Bibliography.

BREWSTER, WILLIAM. Description of a new humming bird from northern Mexico.

Auk, x, July, 1893, pp. 214-215.

Cyanomyia Salvini (Nacosari, Sonora) is described as new. This paper is based in part upon Museum material.

BROOKS, W. EDWIN. A few observations on some species of *Phylloscopus*.

Ibis (Series vi), vi, April, 1894, pp. 261-268.

Remarks on various closely related species of *Phylloscopus*, especially in regard to their specific distinctness as exemplified in their habits, notes, etc. Reference is made to specimens in the Museum collection.

BROWN, EDWARD J. The birds of Smith's Island, Virginia.

Nidologist, i, May, 1894, p. 144.

A list of 63 species found on Smith's Island in May, 1894, of which *Tringa fuscicollis* had not previously been recorded from Virginia. This paper is based in part upon Museum material.

BROWN, HUBERT H. Capture of another *Ardetta neozena* at Toronto, Canada.

Auk, x, October, 1893, pp. 363-364.

Mentions the capture of a specimen of *Ardetta neozena* at Toronto, May 20, 1893.

Specimens in the Museum collection were used for comparison with those recorded.

BROWN, JOSEPH STANLEY.
(See under WILLIAM HEALEY DALL.)

BURNS, FRANK. The Crump burial cave.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1892 (1893), pp. 451-454, pl. ci.

A number of coffins found in this cave are now in the possession of the National Museum.

CHAPMAN, FRANK M. Ornithology at the World's Fair.

Auk, x, October, 1893, pp. 315-321.

An account of the various Government and private exhibits of birds at the World's Fair.

— On the birds of the Island of Trinidad.

Bull. Am. Mus. Nat. Hist., vi, January, 1894, pp. 1-86.

Three hundred and six species are mentioned, of which *Myrmeciza longipes albiventris*, *Chlorospingus leotaudi*, and *Basileuterus vermivorus olivascens* are described as new. Preliminary descriptions appeared in the *Auk*, 1893, p. 342. Four species are added to the avifauna of Trinidad, and several changes in nomenclature are made.

This paper is based in part upon Museum material.

CLARK, ALONZO HOWARD. Report on the historical collections in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 149-157.

CLARKE, FRANK W. Report of committee on determinations of atomic weight, published during 1893.

Journ. Am. Chem. Soc., xvi, No. 3, March, 1894, pp. 179-192.

— Report on the Department of Minerals in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891, (1892), pp. 259-260.

CLARKE, SAMUEL F. Reports on the dredging operations off the west coast of Central America, to the Galapagos, to the west coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U. S. Fish Commission steamer *Albatross*, during 1891, Lieut. Commander Z. L. Tanner, U. S. N., commanding. XI.—The Hydroids.

Bull. Mus. Comp. Zool., xxv, No. 6, February, 1894, pp. 71-77, pls. 1-v.

Ten species were taken, 4 of which are new. All are from the west coast of Central America.

This paper is based upon material which will become the property of the Museum.

COOK, O. F. Notes on Myriapoda from Loanda, Africa, collected by Mr. Héli

COOK, O. F.—continued.

Chatelain, including a description of a new genus and species.

Proc. U. S. Nat. Mus., xvi, No. 968, February 7, 1894, pp. 703-708.

This paper is based upon Museum material.

COULTER, JOHN M. Contributions | from | the U. S. National Herbarium. | Vol. II. | — | Botany of western Texas. | A manual of the Phanerogams and Pteridophytes | of western Texas. | By | John M. Coulter. | Published by authority of the Secretary of Agriculture. | Washington: | Government Printing Office. | 1891-94.

8vo., pp. i-v, 1-588, pls. 1-III.

Part 1 of this work, the Polypetalæ, was issued June 27, 1891; Part 2, the Gamopetalæ, June 2, 1892; and Part 3, the Apetalæ, Monocotyledonæ, and Pteridophyta, May 10, 1894.

Based upon Museum material.

— Manual of the Phanerogams and Pteridophytes of western Texas. Part 3. Apetalæ, Monocotyledonæ, Pteridophyta.

Contrib. U. S. Nat. Herbarium, II, No. 3, May 10, 1894, pp. 347-588.

This paper completes the Manual of the Phanerogams and Pteridophytes of western Texas. It is based upon Museum material.

— Preliminary revision of North American species of Cactus, Anhalonium, and Lophophora.

Contrib. U. S. Nat. Herbarium, III, No. 2, June 10, 1894, pp. 91-132.

Seventy species are enumerated, of which 10 are new.

This paper is based upon Museum material.

COVILLE, FREDERICK VERNON. Botany of the Death Valley Expedition. A report on the botany of the expedition sent out in 1891, by the U. S. Department of Agriculture, to make a biological survey of the region of Death Valley, California.

Contrib. U. S. Nat. Herbarium, IV, November 29, 1893, pp. 1-363, pls. 1-XXI, frontispiece and map.

Contains chapters devoted to an itinerary, principles of plant distribution in southeastern California, characteristics and adaptations of the desert flora, catalogue of species, catalogue of specimens, and bibliography. The whole number of plants enumerated is 1,261, of which 42 are described as new.

— *Ostrya Knowltoni*, a new species of Hop Hornbean.

Garden and Forest, VII, March 21, 1894, p. 114, pl. 23.

COVILLE, FREDERICK VERNON—cont'd.

Describes a tree from the Grand Cañon of the Colorado in northern Arizona.

— Proposed seed collection of the U. S. National Herbarium.

Botan. Gaz., XIX, March 16, 1894, p. 121.

An announcement to botanists, with request for cooperation.

— The genus *Hemicarpha* in North America.

Bull. Torrey Botan. Club, XXI, January 25, 1894, pp. 34-37.

A review of this small genus of sedges, containing a description of one new variety.

— A criticism of the "Synonymy of Juncodes."

Botan. Gaz., XIX, May 15, 1894, p. 208.

COX, ULYSSES O. Description of a new species of *Pipilo* from Mount Orizaba, Mexico.

Auk, XI, April, 1894, pp. 161-162.

Description of *Pipilo orizabæ*, from Mount Orizaba, Mexico. The type is in the National Museum collection.

DALL, WILLIAM HEALEY. *Bulimulus proteus*, Broderip, and its distribution.

Nautilus, VII, No. 3, July, 1893, pp. 26-27.

This paper shows that the true *B. proteus* occurs only in South America. For the distinct Lower California species the name *B. montezuma* is proposed.

— On a new species of *Yoldia* from California.

Nautilus, VII, No. 3, July, 1893, pp. 29-30.

Contains a description of *Yoldia montereyensis*, dredged by the U. S. Fish Commission in the Bay of Monterey, California.

— Preliminary notice of new species of land shell from the Galapagos Islands, collected by Dr. G. Baur.

Nautilus, VII, No. 5, September, 1893, pp. 52-56.

Bulimulus Duncanus, *B. amastroides* var. *anceyi*, *B. Jacobi* var. *vermiculatus*, *B. olla*, *B. tortuganus*, *B. Bauri*, *Hyalina chathamensis*, *Conulus galapaganus*, *Succinea corbis*, and *S. brevior* are described as new.

— Hæckel's Planktonic studies.

Nautilus, VII, No. 8, December, 1893, pp. 86-87.

A notice of Prof. E. Hæckel's paper of 1890, translated and printed in the Report of the U. S. Fish Commission for 1889-1891, pp. 565-641.

— On the species of *Maetra* from California.

Nautilus, VII, No. 12, April, 1894, pp. 136-138, pl. v.

DALL, WILLIAM HEALEY—continued.

Maetra Hemphilli, n. s., is described, and the synonymy of other species corrected. Several species are figured.

— On some species of *Mulinia* from the Pacific coast.

Nautilus VIII, No. 1, May, 1894, pp. 5-6, pl. I.

Mulinia modesta, *M. coloradoënsis* and var. *acuta* and *M. Bradleyi* are described as new.

— (editor). Republication of Conrad's Fossils of the Medial Tertiary of the United States. With an introduction by William Healey Dall. Philadelphia, U. S. A. | Wagner Free Institute of Science. | 1893.

8vo., pp. i-xviii, 1-136, pls. I-XLIX.

The "Medial Tertiary" of Conrad is the classical work in which many of the American Miocene fossils were first described and figured. It has long been out of print and hardly to be found in any library. The reprinting of a limited edition, after obtaining a sufficient number of subscriptions to partially defray the cost, was undertaken by the Wagner Institute, and the editorial work put in the hands of Mr. Dall. The volume comprises a facsimile reproduction of the original text and plates, with introductory explanation, annotations, and index by the editor, clearing up the uncertainties in regard to dates of publication, and placing all the available information for the first time in the hands of students.

— The Phylogeny of the Docoglossa.

Proc. Acad. Nat. Sci. Phila., September, 1893, pp. 285-287.

This paper discusses the origin of the true limpets, and refutes sundry errors of Thiele in the *Gebiss der Schnecken*.

— A subtropical Miocene fauna in Arctic Siberia.

Proc. U. S. Nat. Mus., XVI, No. 946, September 30, 1893, pp. 471-478, pl. LVI.

This paper describes the fossils collected at Coal Bay, Penjinsk Gulf, and Okhotsk Sea by the Ringgold and Rodgers exploring expedition in 1855. *Semele Stimpsoni*, *Siphonaria penjinae*, *Conus okhotensis*, *Cerithium cymatophorum*, and *Diloma ruderata* are described as new. The change of climate in this region since Miocene time is discussed.

— Land shells of the genus *Bulimulus* in Lower California, with descriptions of several new species.

Proc. U. S. Nat. Mus., XVI, No. 958, November 23, 1893, pp. 639-647, pls. LXXI, LXXII.

The distribution of the group is discussed, and it is shown that several of the species extend to the mainland. *Bulimulus (Scutalus) Baileyi*, *Bulimulus (Leptobyrsus) Zeledoni*, and

DALL, WILLIAM HEALEY—continued.

B. (L.) Veseyianus are described as new, and figures are shown giving the internal structure of several of the other species.

— Report on the Department of Mollusks (including Cenozoic fossils), in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 225-229.

DALL, WILLIAM HEALEY, and BROWN, JOSEPH STANLEY. Cenozoic geology along the Apalachicola River.

Bull. Geol. Soc. Am., v, February, 1894, pp. 147-170, pl. 3.

In this paper the stratigraphical geology above the Eocene along the Chattahoochee, Chipola, and Apalachicola rivers, between Bainbridge, Ga., and Blountstown, Fla., is described, and the general Neocene section for the Florida region is discussed and illustrated.

DEWEY, LYSTER H. Difference between the common saltwort and the Russian thistle.

Botan. Gaz., xviii, July, 1893, p. 275.

Descriptions of both forms, with points of difference enumerated. This paper is based upon Museum material.

— Gramineæ.

Contrib. U. S. Nat. Herbarium, II, No. 3, May 10, 1894, pp. 484-551.

This article is included in the "Manual of the Phanerogams and Pteridophytes of western Texas", by John M. Coulter. There are descriptions of 334 species and 55 varieties, accompanied by a key to the genera. This paper is based upon Museum material.

— Russian thistle, its history as a weed in the United States, with an account of the means available for its eradication.

Bull. Div. Bot., U. S. Dept. Agric., No. 15, June, 1894, pp. 1-32, pls. I-III, 2 maps.

A portion of the technical data in this paper is based upon Museum material.

DILLER, J. S., and STANTON, TIMOTHY W. The Shasta-Chico series.

Bull. Geol. Soc. Am., 5, April, 1894, pp. 435-464.

This paper is based in part upon collections of the U. S. Geological Survey, which will become the property of the Museum.

DUTCHER, WILLIAM. The Labrador Duck; another specimen, with additional data respecting extant specimens

Auk, XI, January, 1894, pp. 4-12.

Gives additional information regarding the capture of certain specimens, and presents

DUTCHER, WILLIAM—continued.

theories relative to the causes of extermination.

This paper is based in part upon Museum material.

ECKFELDT, J. W. List of lichens from California and Mexico collected by Dr. Edward Palmer from 1888 to 1892.

Contrib. U. S. Nat. Herbarium., 1, No. 8, October 31, 1893, pp. 291-292.

Forty-two species are enumerated. This paper is based upon Museum material.

EIGENMANN, CARL H. On the occurrence of the Spiny Boxfish (genus *Chilomycterus*), on the coast of California.

Proc. U. S. Nat. Mus., No. 917, July 31, 1893, p. 485, pl. LXXXI.

Description of a fish new to the coast of California. This paper is based upon Museum material.

EMMONS, S. F.

(See under GEORGE PERKINS MERRILL.)

ELLIOT, DANIEL GIRAUD. A monograph of the Pittidæ, or family of Ant Thrushes.

Part I, folio, London, 1893, 10 colored plates and text. Second edition, revised and enlarged.

The following species are figured in this part: *Euicichla Gurneyi*, *E. Schwaneri*, *Pitta moluccensis*, *P. maxima*, *P. venusta*, *P. Rosenbergi*, *P. Oatesi*, *P. angolensis*, *P. arcuata*, and *P. sordida*. Based partly upon Museum material.

— A monograph of the Pittidæ, or family of Ant Thrushes.

Part II, folio, London, 1893, 10 colored plates and text. Second edition, revised and enlarged.

In Part II illustrations of the following species are given: *Euicichla Elliotti*, *Pitta cœrulea* (two plates, showing adult male and female and young), *Anthoicinclia phoyrii*, *Pitta rufiventris*, *P. coronata*, *P. iris*, *P. usheri*, *P. megarhyncha*, and *P. cucullata*. Based partly upon Museum material.

EVERMANN, BARTON W., and KENDALL, WILLIAM C. The fishes of Texas and the Rio Grande Basin, considered chiefly with reference to their geographic distribution.

Bull. U. S. Fish Com., XII, 1892, pp. 57-126, pls. x-L.

This paper is based upon Museum material. (See also under CHARLES H. GILBERT.)

FAXON, WALTER. Reports on the dredging operations off the west coast of Central America, to the Galapagos, to

FAXON, WALTER—continued.

the west coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U. S. Fish Commission steamer *Albatross*, during 1891, Lieut. Commander Z. L. Tanner, U. S. N., commanding. VI.—Preliminary descriptions of new species of Crustacea.

Bull. Mus. Comp. Zool., xxiv, No. 7, August, 1893, pp. 149-220.

Five new genera, 100 new species, and 3 new subspecies are described, of which 2 genera and 5 species are Schizopoda, the remainder being Decapoda.

This paper is based upon material which will become the property of the Museum.

FERNOW, BERNHARD EDUARD. Report on the Section of Forestry in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 171-178.

FLINT, JAMES M. Report on the Section of Materia Medica in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 179-180.

FONTAINE, WILLIAM M. Notes on some fossil plants from the Trinity Division of the Comanche Series of Texas.

Proc. U. S. Nat. Mus., xvi, No. 934, October 6, 1893, pp. 261-282, pls. xxxvi-xliii.

This paper is based upon Museum material.

— Description of some fossil plants from the Great Falls coal field of Montana.

Proc. U. S. Nat. Mus., xv, No. 918, July 29, 1893, pp. 487-495, pls. lxxxii-lxxxiv.

This paper is based upon Museum material.

GILBERT, CHARLES H.

(See under DAVID STARR JORDAN.)

GILBERT, CHARLES H., and EVERMANN, BARTON W. A report upon investigations in the Columbia River Basin, with descriptions of four new species of fishes.

Report of the Commissioner of Fish and Fisheries on Investigations in the Columbia River Basin in regard to the Salmon Fisheries, Washington, 894, pp. 19-54.

This paper is based in part upon Museum material.

GILL, THEODORE. A comparison of antipodal faunas.

Mem. Nat. Acad. Sci., vi, 1893, pp. 89-124.

A comparison of antipodal fish faunas, based on a study of the piscine inhabitants of the

GILL, THEODORE—continued.

British Islands and those of New Zealand. Two hundred and twenty-nine species are enumerated under 105 families. Ten new genera are proposed and briefly diagnosed in supplementary notes. The new genera are named *Evistius*, *Bathystethus*, *Promethichthys*, *Rhombocyttus*, *Capromimus*, *Pagrosomus*, or *Sparosomus*, *Ericentrus*, *Oologrammus*, *Notclinus*, and *Caulopsetta*.

— Families and subfamilies of fishes.

Mem. Nat. Acad. Sci., vi, 1893, pp. 125-138.

An arrangement of the existing families of fishes, including the Teleostomes or true fishes, the classes Myelozoa or Leptocardians, the Marsipobranchii or Myzonts, and the Selachians, the latter including the subclass Holocephali. The list includes 324 families.

— The proper generic name of the Tunnies.

Proc. U. S. Nat. Mus., xvi, No. 965, February 5, 1894, pp. 693-694.

A short paper giving the synonymy of the genus *Thunnus* of South, and advocating its use as the generic name of the Tunnies.

— Sharks in fresh water.

Science, xxii, September 22, 1893, p. 165.

In response to an inquiry, it is asserted that sharks occur in the fresh waters of widely distinct regions, as the Philippine Islands, Australia, and Nicaragua. All belong to the family of Galeids or Carchariids. The species of Lake Nicaragua has been found nowhere else and has been named *Eulamia* or *Carcharias nicaraguensis*.

This paper is based upon Museum material.

— A segregation of fresh-water fishes.

Science, xxii, December 22, 1893, p. 345.

Most fresh-water fishes belong to the Osteiophysal orders. Another case of segregation is exemplified by the Haplomi, including the Esocids, Umbrids, Cyprinodontids, and Amblyopsids. It is suggested that possibly the Percopsids and Aphredoderids should be associated with them.

— A South American Lamprey.

Science, xxiii, January 19, 1894, p. 30.

An Argentine lamprey, found in 1867, was described by Burmeister as *Petromyzon macrostomus*, and in 1893 redescribed and illustrated by Berg as *Geotria macrostomus*. It belongs, however, to a distinct genus named *Ezomegas* in 1882 by Gill. The genus was confirmed by the additional data published by Berg.

— The Erilepudinæ.

Science, xxiii, January 26, 1894, p. 52.

The generic name *Erilepsis* was proposed as a substitute for *Myriolepis* of Lockington, because the latter had been preoccupied. Erilepudinæ is a subfamily proposed for its reception.

This paper is based upon Museum material.

GOODE, GEORGE BROWN. First draft of a system of classification for the World's Columbian Exposition.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 649-735.

— The Genesis of the National Museum.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 273-380.

— Report upon the condition and progress of the U. S. National Museum during the year ending June 30, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 1-131.

— The relation of scientific research to economic problems.

Bull. U. S. Fish Com., 1893, Article 8, pp. 49-58.

An address delivered October 17, 1893, before the World's Fisheries Congress, Chicago.

HASBROUCK, EDWIN M. The geographical distribution of the genus *Megascops* in North America.

Auk, x, July, 1893, pp. 250-264, pls. vii, viii.

Treats of the geographical distribution of the various species and subspecies of *Megascops* in North and Central America, with a graphic representation of their ranges.

This paper is based upon Museum material.

— Evolution and dichromatism in the genus *Megascops*.

Am. Naturalist, xxvii, June, 1893, pp. 521-533; July, 1893, pp. 638-649, 5 maps.

Theories are advanced for the causes of dichromatism in the genus *Megascops* and its relations to evolution. A tabular arrangement of localities is given, showing the proportion of red and gray phases in various parts of the United States. Five maps show the distribution and predominance of each phase geographically, the humidity and temperature, and the proportion of deciduous and coniferous trees, in the region occupied by these birds.

This paper is based upon Museum material.

HAY, W. P. Observations on the Blind Crayfishes of Indiana, with a description of a new subspecies, *Cambarus pellucidus Testii*.

Proc. U. S. Nat. Mus., xvi, No. 935, September 28, 1893, pp. 283-286, pls. XLIV, XLV.

This subspecies was found only in Mayfield Cave, Indiana. In other caves occur forms intermediate between the subspecies and the typical *pellucidus*.

This paper is based upon Museum material.

HENDERSON, JOHN B., JR. List of shells collected in Jamaica.

Nautilus, viii, 1894, No. 1, pp. 1-5; No. 2, pp. 19-24; No. 3, pp. 31-33.

HENDERSON, JOHN B.—continued.

This list includes the specimens collected by Messrs. Charles T. Simpson, of the U. S. National Museum, and John B. Henderson, jr., during an expedition to Jamaica in the winter of 1893-'94. Two hundred and forty-eight species of shells are listed, of which the types are in the national collection.

HITCHCOCK, ROMYN. Shinto, or the mythology of the Japanese.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 489-509.

— The ancient burial mounds of Japan.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 511-523, pls. XXXIII-LXIII.

— Some ancient relics in Japan.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 525-526, pls. LXIV-LXVII.

HOLMES, WILLIAM HENRY. Report on the Department of American Aboriginal Pottery in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), p. 145.

HOLZINGER, JOHN M. Descriptions of four new plants from Texas and Colorado.

Contrib. U. S. Nat. Herbarium, i, No. 8, October 31, 1893, pp. 286-287, pls. xx, XXI.

Two of the species are illustrated. This paper is based upon Museum material.

— List of plants new to Florida.

Contrib. U. S. Nat. Herbarium, i, No. 8, October 31, 1893, p. 288.

Seventeen species new to the flora of Florida are here enumerated. This paper is based upon Museum material.

HOWARD, LELAND O.

(See under CHARLES V. RILEY.)

JORDAN, DAVID STARR. A description of the Golden Trout of Kern River, California, *Salmo mykiss aqua-bonita*.

Proc. U. S. Nat. Mus., xv, No. 916, July 29, 1893, pp. 481-483.

This paper is based upon Museum material.

— Description of a new species of Cypriinoid fish, *Couesius Greeni*, from the headwaters of Frazer River, in British Columbia.

Proc. U. S. Nat. Mus., xvi, No. 938, July 19, 1893, pp. 313-314.

This paper is based upon Museum material.

JORDAN, DAVID STARR, and GILBERT, CHARLES H. Note on the Wall-eyed

JORDAN, DAVID STARR, and GILBERT, CHARLES H.—continued.

Pollack (*Pollachius chalcogrammus fuensis*), of Puget Sound.

Proc. U. S. Nat. Mus., xvi, No. 939, July 19, 1893, pp. 315-316.

This paper is based upon Museum material.

JOUY, PIERRE LOUIS. Notes on birds of central Mexico, with descriptions of forms believed to be new.

Proc. U. S. Nat. Mus., xvi, No. 975, April 18, 1894, pp. 771-792.

One hundred and twelve species are enumerated, of which *Catharus melpomene clarus* (Barranca Ibarra, Jalisco), *Psaltriparus melanotis iulus* (El Molino, Jalisco), and *Spinus psaltria croceus* (western Central America), are described as new.

KENDALL, WILLIAM C. Notes on the fresh-water fishes of Washington County, Me.

Bull. U. S. Fish Com., xiv, 1894, pp. 43-54.

This paper is based in part upon Museum material.

(See also under BARTON W. EVERMANN.)

KENDALL, WILLIAM C., and SMITH, HUGH M. Extension of the recorded range of certain marine and fresh-water fishes of the Atlantic coast of the United States.

Bull. U. S. Fish Com., xiv, 1894, pp. 15-21.

This paper is based upon Museum material.

KNOWLTON, FRANK HALL. Notes on a few fossil plants from the Fort Union group of Montana, with a description of one new species.

Proc. U. S. Nat. Mus., xvi, No. 921, July 24, 1893, pp. 33-36, pls. 1, 11.

Enumerates a few species, one (*Populus Meedsi*) being new to science.

— [Review of] A history of Crustacea. By Thomas R. R. Stebbing.

Public Opinion, xv, August 26, 1893, p. 488.

— Annotated list of the fossil plants of the Bozeman coal field, with table of distribution and descriptions of new species.

Bull. U. S. Geol. Surv., No. 105, pp. 43-67, pls. v, vi.

Enumerates 44 species of fossil plants, 5 of which are new to science, and discusses the relation of fossil plants to the geological age of the field containing them.

— Letter relating to fossil wood from Black Hills, South Dakota.

Journ. Geol., ii, No. 3, April-May, 1894, pp. 260-261.

KNOWLTON, FRANK HALL.—continued.

This article forms a part of a paper by Prof. Lester F. Ward on the "Cretaceous rim of the Black Hills." A specimen of fossil wood showing Araucarian structure is described.

— [Review of] Biological lectures delivered at the Marine Biological Laboratory at Wood's Holl, in 1893.

Public Opinion, xvii, May 17, 1894, p. 151.

— [Review of] The story of our planet. By T. G. Bonney.

Public Opinion, xvii, May 24, 1894, p. 174.

— [Review of] With the wild flowers. By E. M. Harlinger.

Public Opinion, xvii, May 31, 1894, p. 197.

— [Abstract of] The fossil flora of Alaska.

Bull. Geol. Soc. Am., v, April, 1894, pp. 573-590.

An abstract of a paper which will be published in full in the Proceedings of the National Museum.

— Fossil plants as an aid to geology.

Journ. Geol., ii, No. 4, May-June, 1894, pp. 365-382.

The claim is made that the relation of paleobotany to geological investigation will be found to be of as much importance as that of other branches of paleontology.

— [Review of] Butterflies of Northern United States and Canada. By Samuel H. Scudder.

Public Opinion, xvii, April 26, 1894, p. 85.

— [Review of] Our native birds of beauty and song. By H. Nehrling.

Public Opinion, xvii, June 7, 1894, p. 230.

— [Definitions of botanical terms, families, genera, and names of common plants.]

Standard Dictionary of the English Language. Funk & Wagnalls, New York, 1894, Vol. 1.

Over ten thousand definitions of botanical terms were prepared by Mr. Knowlton for this dictionary.

KOEHLER, SYLVESTER ROSA (editor). Japanese wood-cutting and wood-color printing.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1892 (1893), pp. 221-244, pls. iv-xiii, figs. 1-5.

The editor, Mr. S. R. Koehler, gives the substance of a communication from T. Tokuno, chief of Insetsu-kioku (Bureau of Engraving and Printing) of the ministry of finance, Tokyo, Japan. This communication contains a description of the technical methods used by

KOEHLER, SYLVESTER ROSA—cont'd.

Japanese wood-cutters and wood-cut printers. The notes by the editor compare and contrast these methods with those employed in Europe and America. The paper was published as a separate in advance of the Report of which it forms a part.

— Report on the Section of Graphic Arts in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891, (1892), pp. 159-161.

LUCAS, FREDERIC AUGUSTUS. Swifts and humming birds.

Ibis (Series VI), v, July, 1893, pp. 365-371, figs. 1, 2.

Arguing for the relationship of the two groups, and showing some errors in a previous paper by Dr. Shufeldt.

— Individual skeletal variation.

Science, XXII, July 28, 1893, pp. 52-53.

Noting numerous instances of variation and ascribing them to reversion or progression.

— Birds' steering methods.

Nature, XLVIII, August 31, 1893, p. 414.

Noting some of the methods by which birds change their course, and calling in question some statements in a previous article.

— The food of humming birds.

Auk, x, October, 1893, pp. 311-315.

Noting the dissection of twenty-eight specimens, all of which, save two, contained remains of insects.

— The number of ribs in *Cypseloides*.

Auk, x, October, 1893, pp. 365-366.

Calls attention to the discovery that *Cypseloides* has seven pairs of ribs, or one more than in any passerine bird.

— Note on the air sacs and hollow bones of birds.

Natural Science, iv, January, 1894, pp. 36-37.

A response to a previous article. Suggests that the use of the air sacs is largely to serve as a buffer, and that the hollow bones aid in equalizing the pressure when a bird changes level or dives from air into water.

— The tongue of the Cape May Warbler.

Auk, XI, April, 1894, pp. 141-144.

Describes the tongue in some species of birds, and shows that the figure said to be that of the tongue of *Perissoglossa tigrina* in Baird's "Review of North American Birds," is really that of some member of the *Cærebidae*.

— Report on the Department of Vertebrate Fossils in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), p. 223.

LUCAS, FREDERIC AUGUSTUS—cont'd.

Report on the Department of Comparative Anatomy in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 243-244.

McCORMICK, L. M. A hybrid Tanager.

Auk, x, July, 1893, pp. 302-303.

Notes on a hybrid between *Piranga erythromelas* and *P. rubra*, with description and measurements.

The specimen is in the Museum collection.

McMURRICH, J. PLAYFAIR. Scientific results of explorations by the U. S. Fish Commission steamer *Albatross*. No. XXIII.—Report on the Actiniæ collected by the U. S. Fish Commission steamer *Albatross* during the winter of 1887-1888.

Proc. U. S. Nat. Mus., xvi, No. 930, July 29, 1893, pp. 119-216, pls. XIX-XXXV.

Part I deals with the classification of the Anthozoa, and especially of the Actiniæ. In Part II the tribes, genera, and species represented in the *Albatross* collection are described. In Part III are given the geographical and bathymetrical distribution. The report concludes with a bibliography.

This paper is based upon Museum material.

MANN, ALBERT. List of Diatomaceæ from a deep-sea dredging in the Atlantic Ocean, off Delaware Bay, by the U. S. Fish Commission steamer *Albatross*.

Proc. U. S. Nat. Mus., xvi, No. 937, July 17, 1893, pp. 303-312.

This paper is based upon Museum material.

MASON, OTIS TUFTON. Migration and the food quest; a study of the peopling of America.

Am. Anthropologist, vii, 1894, pp. 275-292.

This paper, dismissing all imaginary and accidental occurrences, examines the great circle of the earth passing from the Strait of Malacca to the Columbia River, and thence through Mexico and Peru. It is shown that it is a route to America perfectly feasible to savages, abounding in food, in line with aerial and oceanic currents, and in historic times occupied by peoples in unbroken chain of connection.

— Technogeography, or the relation of the earth to the industries of mankind.

Am. Anthropologist, vii, 1894, pp. 137-161.

The object of this paper is to show that the earth is an organized structure with relation to human history, and that the motive and genius of human activities spring from earthly materials, powers, and forces.

MASON, OTIS TUFTON—continued.

Report on the Department of Ethnology in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 135-144.

— Throwing-sticks from Mexico and California.

Proc. U. S. Nat. Mus., xvi, No. 932, July 19, 1893, pp. 219-221, figs. 1-6.

— Summary of progress in anthropology in 1891.

Rep. Smithsonian Inst., 1891 (1893), pp. 433-502.

— Progress of anthropology in 1892.

Rep. Smithsonian Inst., 1892 (1893), pp. 465-512.

MERRIAM, C. HART. Two new Wood Rats from the plateau region of Arizona (*Neotoma pinetorum* and *N. arizonæ*), with remarks on the validity of the genus *Teonoma* of Gray.

Proc. Biol. Soc. Wash., viii, July 31, 1893, pp. 109-112.

This paper is based upon Museum material.

— Descriptions of eight new ground squirrels of the genera *Spermophilus* and *Tamias*, from California, Texas, and Mexico.

Proc. Biol. Soc. Wash., viii, December 28, 1893, pp. 129-138.

This paper is based upon Museum material.

— The Yellow Bear of Louisiana, *Ursus luteolus*, Griffith.

Proc. Biol. Soc. Wash., viii, December 29, 1893, pp. 147-152.

This paper is based upon Museum material.

— Preliminary descriptions of four new mammals from southern Mexico, collected by E. W. Nelson.

Proc. Biol. Soc. Wash., viii, December 29, 1893, pp. 143-146.

This paper is based upon Museum material.

— Preliminary description of eleven new Kangaroo Rats of the genera *Dipodomys* and *Perodipus*.

Proc. Biol. Soc. Wash., ix, June 21, 1894, pp. 109-116.

This paper is based upon Museum material.

MERRILL, GEORGE PERKINS. [The newer eruptive rocks of Nantasket, Mass.]

Occasional Papers of the Boston Society of Natural History, iv, 1893, pp. 31-44.

Article in paper entitled "Geology of the Boston Basin," by William O. Crosby.

MERRILL, GEORGE PERKINS—cont'd.

Describes the petrographic character of the ancient lavas and plutonic rocks of the region above indicated. The lavas are referred to the melaphyr and porphyrite groups; the plutonic rocks are mainly diabase, but they also include an important series of porphyrite dikes and at least one dike of melaphyr. "The dikes of porphyrite and melaphyr are believed by Professor Crosby to be contemporaneous with the surface flows of these rocks, while he finds the numerous diabase dikes are certainly newer in most, and probably in all, cases than the melaphyr and porphyrite."

— Report upon rocks collected from the Galapagos Islands.

Bull. Mus. Comp. Zool., xvi, No. 13 (Geological Series, II), July, 1893, pp. 235-237.

Describes briefly a few specimens of basaltic rocks collected from the islands during the cruise of the *Albatross*.

— Lithographic limestone.

Mineral Industries, ii, 1893, by R. P. Rothwell, New York, pp. 453-456.

Gives the chief sources and describes the chemical properties of stones used for lithographic purposes.

— The onyx marbles.

Mineral Industries, ii, 1893, by R. P. Rothwell, New York, pp. 481-486.

Gives the sources and general physical and chemical properties of such stones as are at present put upon the market as onyx marbles.

— [Microscopical discussion of the Beaver Creek meteorite.]

Am. Journ. Sci., xlvi, June, 1894, p. 435.

Article in paper entitled "Beaver Creek Meteorite," by E. E. Howell.

Describes the stone as of the chondritic variety, very friable, and consisting of olivine, enstatite, with possibly plagioclase feldspar, metallic iron, etc.

— Building stone.

Johnson's Universal Cyclopædia, i, pp. 823-826.

A condensed statement regarding the stones in common use for building and decoration, with particular reference to those of the United States.

— Report on the Department of Geology in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 261-270, 2 diagrams.

— (editor). [Definitions of technical terms relating to the subject of building stones.]

Standard Dictionary of the English Language. Funk & Wagnalls, New York, 1894, Vol. I.

MERRILL, GEORGE PERKINS, and EMMONS, S. F. Geological sketch of Lower California.

Bull. Geol. Soc. Am., v, 1894, pp. 489-514.

Gives the results of observations made by both observers, independently, during the season of 1892, and a résumé of the conclusions of previous observers. The particular region discussed is that along the thirtieth parallel.

MITCHELL, J. D. List of Texas Mollusca.

12mo., pp. 1-22, Victoria, Tex., 1894.

Many of the species mentioned in this list were identified at the National Museum for Mr. Mitchell.

NELSON, E. W.: Description of a new species of *Lagomys* from Alaska.

Proc. Biol. Soc. Wash., VIII, December 21, 1893, pp. 117-120.

This paper is based upon Museum material.

— Description of a new species of *Arvicola* of the *Mynomes* group, from Alaska.

Proc. Biol. Soc. Wash., VIII, December 28, 1893, pp. 139-142.

This paper is based upon Museum material.

NELSON, E. W., and PALMER, T. S. Descriptions of five new birds from Mexico.

Auk, XI, January, 1894, pp. 39-45.

Megascops pinosus (Las Vegas, Vera Cruz), *Megascops Ridgwayi* (Patzcuaro, Michoacan), *Glaucidium Fisheri* (Tochimilco, Puebla), *Aimophila rufescens pallida* (Etzatlán, Jalisco), and *Sitta carolinensis mexicana* (Mount Orizaba, Puebla) are described as new.

This paper is based upon Museum material.

NEWCOMBE, CHARLES F. Report on the marine shells of British Columbia.

Bull. Nat. Hist. Soc. British Columbia, I, 1893, pp. 31-72.

This comprises a bibliography of the literature relating to the mollusks of British Columbia, and a systematic list of species with geographic and bathymetric notes.

This paper is based in part upon Museum material.

OGILVIE-GRANT, W. R. Catalogue | of the | Game Birds | (Pterocletes, Gallinae, Opisthocomi, Hemipodii) | in the | Collection | of the | British Museum. | By W. R. Ogilvie-Grant. | London: | Printed by order of the Trustees. | 1893.

8vo., pp. i-xvi, 1-585, pls. I-VIII.

This work, constituting Vol. XXII of the Catalogue of the Birds in the British Museum, embraces four "orders," represented by over 7,000 specimens in the British Museum. Four hun-

OGILVIE-GRANT, W. R.—continued.

dred and twenty-six species are recognized, of which *Gennæus Davidsoni*, *G. Oatesi*, "*Ortyx*" *atriceps*, *Crax panamensis*, and *C. Grayi* are new. The following genera are here characterized for the first time: *Dactylortyx*, *Rhynchortyx*, and *Eulipoa*. Descriptions and synonymy accompany each species, with a list of the specimens contained in the British Museum.

Material from the U. S. National Museum was made use of in connection with the preparation of this work.

PACKARD, ROBERT L. Note on a blue mineral, supposed to be ultramarine, from Silver City, New Mexico.

Proc. U. S. Nat. Mus., XVII, No. 978, May 4, 1894, pp. 19-20.

Describes the chemical and physical properties of an earthy indigo blue mineral which had been identified by local authorities as ultramarine. It proved to be a hydrous magnesian silicate allied to the talcs. This paper is based upon Museum material.

— Variscite from Utah.

Am. Journ. Sci., XLVII, April, 1894, pp. 297-298.

Gives the results of chemical and microscopic examination of a beautiful blue massive variscite, sent to the Museum by Mr. F. T. Millis, of Lehi, Utah.

PALMER, T. S.

(See under E. W. NELSON.)

PECK, JAMES I. Scientific results of explorations by the U. S. Fish Commission steamer *Albatross*. No. XXVI. Report on the Pteropods collected by the U. S. Fish Commission steamer *Albatross* during the voyage from Norfolk, Va., to San Francisco, Cal., 1887-88.

Proc. U. S. Nat. Mus., XVI, No. 943, September 30, 1893, pp. 451-466, pls. LIII-LV.

The material upon which this paper is based is now in the Museum collection.

PILSBRY, HENRY A. Monograph of the Polyplacophora.

Manual of Conchology (Academy of Natural Sciences of Philadelphia), xv, parts 57, 58, November, 1893, and March, 1894, pp. 1-132.

These two parts complete the monograph of the Chitonidæ by Mr. Pilsbry, who was accorded the use of the unfinished manuscript and drawings relating to Chitons, which had been prepared by the late Dr. P. P. Carpenter, under the auspices of the Smithsonian Institution. Mr. Pilsbry also had the use of such specimens belonging to the national collection as might facilitate his work.

RATHBUN, MARY J. Catalogue of the crabs of the family *Maidæ* in the U. S. National Museum.

Proc. U. S. Nat. Mus., xvi, No. 927, July 26, 1893, pp. 63-103, pls. III-VIII.

A key to the subfamilies, genera, and species is followed by a catalogue of the species in the Museum. In an appendix is given an "Extract from an unpublished report of Dr. William Stimpson, on the Crustacea of the North Pacific Exploring Expedition, 1853-1856."

— Scientific results of explorations by the U. S. Fish Commission steamer *Albatross*. XXIV.—Descriptions of new genera and species of crabs from the west coast of North America and the Sandwich Islands.

Proc. U. S. Nat. Mus., xvi, No. 933, July 21, 1893, pp. 223-260.

Six genera and 46 species are described, 7 of which were found at the Sandwich Islands.

— Descriptions of new species of American fresh-water crabs.

Proc. U. S. Nat. Mus., xvi, No. 959, November 23, 1893, pp. 649-661, pls. LXXIII-LXXVII.

Descriptions of 8 species of *Pseudothelphusa*, 1 of *Potamocarcinus*, 2 of *Epilobocera*, and 1 of *Trichodactylus*, all from tropical America.

— Descriptions of two new species of crabs from the western Indian Ocean, presented to the U. S. National Museum by Dr. W. L. Abbott.

Proc. U. S. Nat. Mus., xvii, No. 979, May 4, 1894, pp. 21-24.

Descriptions of *Hypocælus Abbotti*, from Aldabra Island, and *Deckenia cristata*, from the Seychelles.

— Descriptions of a new genus and two new species of African fresh-water crabs.

Proc. U. S. Nat. Mus., xvii, No. 980, May 4, 1894, pp. 25-27.

The types were found in mud, under boards and timbers, by Mr. J. H. Camp, at Stanley Pool, Kongo.

Reprinted in *Ann. Mag. Nat. Hist.* (6), xiv, 1894, pp. 72-74.

— Descriptions of a new genus and four new species of crabs from the Antillean region.

Proc. U. S. Nat. Mus., xvii, No. 986, advance sheet, March 30, 1894, pp. 83-86.

The new genus and 3 of the species were collected by the *Albatross* in her West Indian cruise of 1885. The other species was collected by Dr. Edward Palmer.

RATHBUN, RICHARD. Summary of the fishery investigations conducted in the North Pacific Ocean and Bering Sea, from July 1, 1888, to July 1, 1892, by

RATHBUN, RICHARD—continued.

the U. S. Fish Commission steamer *Albatross*.

Bull. U. S. Fish Com., xii, 1892, pp. 127-201, pls. LI-LV.

Reviews the work in the different regions visited by the *Albatross*, including the dredgings made, the state of the fisheries, and the fishes taken. The paper concludes with a list of charts and other publications bearing upon the fishery investigations.

— Report on the Department of Marine Invertebrates in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 235-241.

RHOADS, SAMUEL N. The Hudsonian Chickadee and its allies, with remarks on the geographic distribution of bird races in boreal America.

Auk, x, October, 1893, pp. 321-333.

Describes *Parus Hudsonicus ungarva* as a new subspecies. The geographical distribution of several species in arctic America is remarked upon, especially in their relation to the various races of *Parus Hudsonicus*.

This paper is based largely upon Museum material.

— The *Vireo Huttoni* group, with description of a new race from Vancouver Island.

Auk, x, July, 1893, pp. 238-241.

Describes *Vireo Huttoni insularis* as a new subspecies, and gives notes on the other forms of this group.

This paper is based partly upon Museum material.

RICHMOND, CHARLES W. Notes on a collection of birds from eastern Nicaragua and Rio Frio, Costa Rica, with a description of a supposed new *Trogon*.

Proc. U. S. Nat. Mus., xvi, No. 947, October 4, 1893, pp. 479-532.

An annotated list of 281 species is given, of which *Trogon chrysomelas* (Escondido River, Nicaragua) is described as new.

RIDGWAY, ROBERT. Description of a supposed new species of *Odontophorus* from southern Mexico.

Proc. U. S. Nat. Mus., xvi, No. 945, July 21, 1893, pp. 469-470.

Odontophorus consobrinus (Mirador, Vera Cruz) is described as new.

— Descriptions of some new birds collected on the islands of Aldabra and Assumption, northwest of Madagascar, by Dr. W. L. Abbott.

Proc. U. S. Nat. Mus., xvi, No. 953, advance sheet, August 10, 1893, pp. 597-600.

RIDGWAY, ROBERT—continued.

Iecocincla madagascariensis rostrata (Aldabra and Gloriosa), *Buchanga aldabranus*, *Foudia aldabrana*, *Rougetius aldabranus*, *Ibis Abbotti* (Aldabra), *Sula Abbotti* (Assumption), and *Turtur saturatus* (Ile Poivre, Amirantes) are described as new.

— Remarks on the avian genus *Myiarchus*, with special reference to *M. yucatanensis*, Lawrence.

Proc. U. S. Nat. Mus., xvi, No. 955, October 25, 1893, pp. 605-608.

The subgeneric names *Eribates* and *Deltarhynchus* are proposed, and *Myiarchus yucatanensis* and allied forms are elucidated.

— On a small collection of birds from Costa Rica.

Proc. U. S. Nat. Mus., xvi, No. 956, October 28, 1893, pp. 609-614.

Critical notes on 10 species are given, and *Butorivopsis ceruleigularis*, Cherrie is described as new.

— Scientific results of explorations by the U. S. Fish Commission steamer *Albatross*. No. XXVII.—Catalogue of a collection of birds made in Alaska by Mr. C. H. Townsend during the cruise of the U. S. Fish Commission steamer *Albatross* in the summer and autumn of 1888.

Proc. U. S. Nat. Mus., xvi, No. 960, November 24, 1893, pp. 663-665.

A list of 35 species, with number of specimens, localities, and dates of each. The first plumage of *Troglodytes hiemalis pacificus* is described.

— A revision of the genus *Formicarius*, Boddaert.

Proc. U. S. Nat. Mus., xvi, No. 961, November 28, 1893, pp. 667-686.

A study of the genus *Formicarius*, based on nearly sixty specimens. The following forms are described as new: *Formicarius nigricapillus*, Cherr.e (Costa Rica to western Ecuador), *F. satiniatus* (Trinidad and Venezuela, to Colombia), and *F. umbrosus* (eastern Costa Rica to Nicaragua).

— Note on *Rougetius aldabranus*.

Auk, xi, January, 1894, p. 74.

The Assumption Island bird, previously referred to this species, is described as new (*Rougetius Abbotti*).

— *Picicorvus* an untenable genus.

Auk, xi, April, 1894, p. 179.

Picicorvus columbianus is found to be inseparable generically from *Nucifraga*. The generic name *Picicorvus* is therefore supplanted by *Nucifraga*.

RIDGWAY, ROBERT—continued.

[Review of] Allen's notice of some Venezuelan birds, collected by Mrs. H. H. Smith.

Auk, xi, January, 1894, p. 66.

— [Review of] Allen's list of birds collected in northwestern Sonora and northwestern Chihuahua.

Auk, xi, January, 1894, pp. 66-67.

— [Review of] Chapman's notes on birds observed near Trinidad, Cuba.

Auk, xi, January, 1894, p. 61.

— Description of a new Storm Petrel from the coast of western Mexico.

Proc. U. S. Nat. Mus., xvi, No. 962, November 24, 1893, pp. 687-688.

Oceanodroma Townsendi (Lower California and coast of northwestern Mexico) is described.

— Description of a new *Geothlypis* from Brownsville, Tex.

Proc. U. S. Nat. Mus., xvi, No. 964, February 5, 1894, pp. 691-692.

Geothlypis poliocephala Ralphi is described.

— On geographical variation in *Sialia mexicana*, Swainson.

Auk, xi, April, 1894, pp. 145-160.

Results of study embracing nearly 130 specimens of this species. Townsend's name, *occidentalis*, is revived for the bird of the Pacific region, and *Sialia mexicana Bairdi* is named as a new race from the Rocky Mountain region.

— [Review of] Chapman on the birds of the island of Trinidad.

Auk, xi, April, 1894, p. 173.

— Report on the Department of Birds in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 207-211.

RILEY, CHARLES VALENTINE. Further notes on *Yucca* insects and *Yucca* pollination.

Insect Life, v, No. 5, July, 1893, pp. 300-310, pl. ii, fig. 38.

Records new observations, showing that *Pronuba maculata* is the only insect which fertilizes *Yucca Whipplei*; that *Yucca baccata*, Torrey, *Y. rupicola*, Scheele, and *Y. elata*, Engelm are pollinated by *Pronuba yuccasella*, and that *Pronuba synthetica* pollinizes *Yucca brevifolia*; refers to a black variety of *Pronuba maculata* connected with var. *graminifolia* of *Yucca Whipplei*; reviews the species of *Prodoxus* and their food plants, and describes *Prodoxus intricatus*, n. s.; compares larval habits of *Pronuba* and *Prodoxus*; shows variability of wing markings in *Prodoxus*; figures *Yucca Whipplei* and

RILEY, CHARLES VALENTINE—cont'd.

Prodoxus cinereus in all stages. This paper was read before the Biological Society of Washington, May 20, 1893.

— *Antaplaga Kæbelei*, n. s.

Insect Life, v, No. 5, July, 1893, pp. 333-334.

Describes a new species of Noctuid, collected by A. Koebele in the Argus Mountains.

— The White Pine Aphis.

Scientific American, LXIX, No. 1, July 1, 1893, p. 7.

Treats of the White Pine Aphis (*Lachnus strobi*, Fitch) in Nebraska, its life history and remedies. Its natural enemies are ordinarily sufficient to keep it in check.

— Remedies for Tent Caterpillars and Fall Webworm on plum trees.

Scientific American, LXIX, No. 3, July 15, 1893, p. 45.

— *Homalodisca coagulata*.

Scientific American, LXIX, No. 6, August 5, 1893, p. 93.

Treats of the Glassy-winged Sharpshooter (*Homalodisca coagulata*), its habits and distribution.

— Remedies for the Apple Plant Louse.

Scientific American, LXIX, No. 6, August 5, 1893, p. 93.

Treats of the remedies for the Apple Plant Louse (*Aphis mali*).

— Large Click beetle.

Scientific American, LXIX, No. 6, August 5, 1893, p. 93.

Treats of the large Click beetle (*Alaus oculatus*) and its food habits.

— The Ox Bot Fly.

Scientific American, LXIX, No. 8, August 19, 1893, p. 118.

States that the American species is *Hypoderma lineata* (not *H. bovis*), and gives its life history, which has hitherto been misunderstood. The eggs are laid on the hairs, especially around the heels of the cattle, and are taken into the mouth when they lick themselves. The larva enters the oesophagus and remains inside for eight or nine months, slowly working its way out in the region of the back, enters the ground, pupates, and the perfect fly issues in a few weeks.

Reprint from *Insect Life*, iv, Nos. 9 and 10, June, 1892, pp. 302-317.

— Oyster-shell Bark louse.

Scientific American, LXIX, No. 19, November 4, 1893, p. 301.

Recommends kerosene emulsion for exterminating the oyster-shell bark louse on ash trees.

— The systematic position of the Diptera.

Science, xxii, No. 562, November 10, 1893, p. 260.

RILEY, CHARLES VALENTINE—cont'd.

Advocates taking into account the intelligence of insects in discussing the relative rank of the groups. Considers the Hymenoptera of higher rank than the Diptera.

— Remedies for Croton Bugs.

Scientific American, LXIX, No. 26, December 23, 1893, p. 412.

— Scientific results of the United States Eclipse Expedition to West Africa, 1889-90. Report upon the Insecta, Arachnida, and Myriapoda.

Proc. U. S. Nat. Mus., xvi, No. 951, October 23, 1893, pp. 565-590, pl. LXX, figs. 1-13.

A classified list of the insects collected, with an introduction. Descriptions of new species of Odonata are given by P. P. Calvert, and of Arachnida, by Nathan Banks and Dr. George Marx.

— A wax-like scale insect (*Ceroplastes floridensis*, Comstock).

Scientific American, LXX, No. 1, January 6, 1894, p. 13.

— The Wheel bug (*Prionidus cristatus*).

Scientific American, LXX, No. 2, January 13, 1894, p. 29.

— The eggs of *Microcentrus retinervis*.

Scientific American, LXX, No. 2, January 13, 1894, p. 28.

— Report of the Entomologist for 1893.

Rep. Secy. Agric., 1893, pp. 199-226, pls. 1-4.

Contains recommendations in regard to the future work of the division; notes on destructive locusts; the Western Cricket (*Anabrus simplex*); the Orange Mealy wing (*Aleyrodes citri*); the Periodical Cicada; the Hop Plant Louse in the Northwest; the Red-legged Flea beetle (*Orepiodera rufipes*); further Boll worm investigation; Japanese insects; *Diaspis amygdali* imported into California; proposed introduction of *Erastria scitula*; introduction of Hessian-fly parasites; work of the field agents; the San José scale and its appearance in the East; and the West Indian Peach *Diaspis*.

Also printed as a separate.

— Parasitism in bees of the genus *Stelis*.

Farmers' Review, August 2, 1893.

Records, after C. Verhoeff, of Bonn, Germany, in *Zoologischer Anzeiger*, the way in which *Stelis* parasites *Osmia*.

Reprint from *Scientific American*, LXVII, No. 21, November 19, 1892, p. 322.

— Beetles injuring furniture.

Scientific American, LXX, No. 24, June 16, 1894, p. 381.

Recommends the use of kerosene oil to prevent *Lyctus striatus* from destroying furniture.

— How to get rid of cutworms.

Scientific American, LXX, No. 23, June 9, 1894, p. 362.

Recommends poisoned baits and traps.

RILEY, CHARLES VALENTINE—cont'd.

Social insects from psychical and evolutionary points of view. Annual address of the president of the Biological Society of Washington.

Proc. Biol. Soc. Wash., ix, April, 1894, pp. 1-74, figs. 1-12.

Gives an elaborate philosophy on the organized societies of bees, ants, wasps, and termites; their economy, division of labor, more important special organs and variations, the slave-making habits and migrations of the ants, the different forms in a termite colony, the senses and intelligence of insects generally, heredity and natural selection. Special notes are appended on the principal races of *Apis mellifica*, the species of *Apis* with their varieties, polliniferous organs in bees, wax-producing organs, ant economy, and termite economy.

— The periodical Cicada, alias "Seventeen-year Locust."

Scientific American, LXX, No. 23, June 9, 1894, p. 355, figs. 1-3; No. 24, June 16, 1894, pp. 378-379.

Gives an account of the life history of this insect under the following headings: Seventeen-year and thirteen-year broods, two distinct forms; food of the larva; depth of the larval burrow; method of burrowing; galleries made by the pupa; final transformation; oviposition; larval development; enemies of the cicada; supposed sting of the cicada; the cicada vs. civilization; some reflections on the popular name.

— Parasitic and predaceous insects in applied entomology.

Insect Life, vi, No. 2, December, 1893, pp. 130-141.

There are two methods by which farmers and horticulturists can utilize or encourage their friends among the insects: (1) By the protection of species already existing in a given locality, and (2) by the introduction of such new species as are desirable. The most important of the predaceous species are the Carabidæ and the Coccinellidæ. Hints are given on the protection of parasites, and instances of successful transportation from one place to another are noted. A short history is given of the introduction of Australian ladybirds into California to check the ravages of the scale insects, and also of the introduction of *Clerus formicarius* from Europe to destroy bark beetles. The importation of the natural enemies of the Gypsy Moth, the Caprifig insect, from Smyrna, and *Erastria scitula*, from the Mediterranean country, is recommended.

This paper was read before the Association of Economic Entomologists, Madison, Wis., August 18, 1893, and was also published in the *Scientific American Supplement*, XXXVI, No. 937, December 16, 1893, p. 14979.

RILEY, CHARLES VALENTINE—cont'd.

Report on the Department of Insects in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 231-233.

RILEY, CHARLES VALENTINE, and HOWARD, LELAND O. [Extracts from correspondence; notes from correspondents; general notes; special notes.]

Insect Life, v, No. 5, July, 1893, pp. 289-297, 342-366;

Insect Life, vi, No. 1, November, 1893, pp. 1-5, 32-58;

Insect Life, vi, No. 2, December, 1893, pp. 59-60;

Insect Life, vi, No. 3, February, 1894, pp. 207-212, 265-281;

Insect Life, vi, No. 4, May, 1894, pp. 283-286, 327-346.

— The present year's appearances of the periodical Cicada.

Insect Life, v, No. 5, July, 1893, pp. 298-300.

Reviews the records of Brood XVI—*tredecim* (1880-1893), and Brood XI—*septendecim* (1876-1893), and invites correspondence to confirm, correct, or amplify the records.

— The cocoanut and guava Mealy-wing (*Aleurodicus cocois*, Curtis).

Insect Life, v, No. 5, July, 1893, pp. 314-317.

Previously known to live on the cocoanut in Barbadoes and Demerara, this insect is now recorded to attack the guava in Trinidad. A full description of all its stages is given, with illustrations.

— The Sugar-beet Web worm (*Loxostege strictalis*, L.).

Insect Life, v, No. 5, July, 1893, pp. 320-322, figs. 42-45.

Records the damage by this Pyralid in Nebraska in 1892, and suggests remedies. It hibernates as a cocoon. Illustrations of all stages are given.

— The Red-legged Flea-beetle (*Crepipodera rufipes*, L.).

Insect Life, v, No. 5, July, 1893, pp. 334-342, 1 fig.

Gives correspondence and reports regarding the ravages of this beetle on fruit trees in Virginia, and reviews its habits and geographical distribution. An adult beetle is figured.

— An important predatory insect (*Erastria scitula*, Rambur.).

Insect Life, vi, No. 1, November, 1893, pp. 6-10.

Reviews after Dr. H. Rouzaud, of Montpellier, the life history of this Noctuid, which feeds upon the Black Scale of the olive (*Le-*

RILEY, CHARLES VALENTINE, and HOWARD, LELAND O.—continued.

canium oleæ, Bernard). Discusses the advantages and conditions of introducing it into California, where the same scale insect occurs.

ROSE, JOSEPH NELSON. Descriptions of three new plants.

Contrib. U. S. Nat. Herbarium, 1, No. 8. October 31, 1893, pp. 289-290, pls. xxii, xxiii.

Three new species are described, 2 of which are illustrated. This paper is based upon Museum material.

— A new *Bumelia* from Mexico.

Garden and Forest, vii, May 16, 1894, p. 195.

A short account is given of the discovery and uses of this tree, with a technical description. This paper is based upon Museum material.

SALVADORI, T. Catalogue of the Columbæ, or Pigeons, in the Collection of the British Museum. By T. Salvadori. London: Printed by order of the Trustees. 1893.

8vo., pp. i-xviii, 1-876, pls. 1-xv.

In this work, which constitutes Vol. XXI of the Catalogue of the Birds in the British Museum, 458 species are recognized, their descriptions and synonymy being given. The order Columbæ is divided into 2 suborders, Columbæ and Didi; the former is further divided into 5 families, as follows: Treronidæ, Columbidae, Peristeridæ, Gouridæ, and Didunculidæ. The suborder Didi contains 2 genera of fossil birds, forming a single family, Dididæ. The following new generic and subgeneric names are proposed: *Nesenas*, *Oxyptelia*, *Caloptelia*, *Histriophaps*, *Zonophaps*, *Cryptophaps*, and *Homopelia*. Twelve new species are characterized, as follows: *Osmotreron Wallacii*, *Phabotreron occipitalis*, *Ptilopus Smithsonianus*, *Columba crissalis*, *Turturana Sharpei*, *T. incerta*, *Macropygia goldiei*, *Zenaida yucatanensis*, *Turtur Shelleyi*, *Geotrygon venezuelensis*, *Phlogœnas Granti* (new name for *Phlogœnas Solomonensis*), and *P. albicollis*.

Material from the U. S. National Museum was made use of in connection with the preparation of this work.

SCHIMKÉWITSCH, W. M. Reports on the dredging operations off the west coast of Central America, to the Galapagos, to the west coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U. S. Fish Commission steamer *Albatross*, during 1891, Lieut. Commander Z. L. Tanner, U. S. N., commanding. VIII.—Compte-rendu sur

SCHIMKÉWITSCH, W. M.—continued. les Pantopodes, recueillis pendant les explorations de l'*Albatross* en 1891.

Bull. Mus. Comp. Zool., xxv, No. 2, December, 1893, pp. 27-43, pls. 1, II.

Nine species were found, 5 of which are new. A diagnostic table is given of the species of *Colossendeis*.

This paper is based upon material which will become the property of the Museum.

SHARPE, R. BOWDLER. Catalogue of the Fulicariæ (Rallidæ and Heliornithidæ) and Alectorides (Aramidæ, Eurypygidæ, Mesitidæ, Rhinocchetidæ, Gruidæ, Psophiidæ, and Otididæ) in the Collection of the British Museum. By R. Bowdler Sharpe. London: Printed by order of the Trustees. 1894.

8vo., pp. i-xiii, 1-353, pls. 1-1x.

This volume, which constitutes No. xxiii of the Catalogue of the Birds in the British Museum, covers the 9 families embraced in the Fulicariæ and Alectorides, of which the British Museum collection contains over 3,000 specimens, referable to 252 or more species. Two hundred and ninety-three species and subspecies are recognized, accompanied by descriptions, synonymy, and tables showing the number of specimens of each species, with their localities, etc., in the British Museum. The following generic term is proposed: *Heterotetrax* (for *Heterotis*, preoccupied in fishes). *Rallus æquatorialis*, *Limnopardalus vigilantis*, *Aramidæ gutturalis*, *Porzana galapagensis*, *Corethura reichenovi*, and *Grus kilfordi* are here named as new.

Material from the U. S. National Museum was made use of in connection with the preparation of this work.

SHUFELDT, ROBERT W. Notes on the trunk skeleton of a hybrid Grouse.

Auk, x, No. 3, July, 1893, pp. 281-285.

The skin of this specimen is in the collection of Mr. William Brewster, of Cambridge Mass.; the skeleton now belongs to the U. S. National Museum. Both show the individual to have been produced by a cross between *Tympanuchus americanus* and *Pediocetes p. campestris*.

— Nesting habits of *Galeoscoptes carolinensis*.

Auk, x, No. 3, July, 1893, pp. 303-304.

This paper is based in part upon Museum material.

— On *Protopterus annectens*.

Science, xxii, No. 544, July 7, 1893, pp. 2-3.

This paper is based in part upon Museum material.

SHUFELDT, ROBERT W.—continued.

A case of familiarity on the part of the Cat-bird.

Observer, iv, No. 7, July, 1893, pp. 214-215.

— Mounted game birds in the U. S. National Museum.

Forest and Stream, xli, No. 8, August 26, 1893, p. 161, figs. 1, 2; No. 9, September 2, 1893, pp. 183-184, figs. 3, 4; No. 10, September 9, 1893, p. 205, figs. 5, 6; No. 11, September 16, 1893, p. 228, figs. 7-9.

A series of articles on the taxidermic work of the U. S. National Museum. The marked progress made in certain directions in recent years is pointed out. The papers are accompanied by illustrations of mounted specimens, as follows: Wild Turkey, English Pheasant, Ruffed Grouse, Black Cock, Richardson's Grouse, the Dusky Grouse, and several species of partridges.

— Audubon, the naturalist.

Great Divide, x, No. 1, September, 1893, pp. 8-9, figs. 1-5.

A brief sketch of the life and work of John James Audubon; with illustrations.

— Habits of rattlesnakes.

Great Divide, x, No. 2, October, 1893, p. 25.

This paper is based in part upon Museum material.

— The Opah.

Forest and Stream, xli, No. 14, October 7, 1893, p. 293, fig. 1.

Natural history notes on the species (*Lampris guttatus*). An illustration is given of a specimen in the Museum collection.

— Reason versus instinct.

Pop. Sci. News, xxvii, No. 10, October, 1893, pp. 155-156.

— The Opah.

Forest and Stream, xli, No. 16, October 21, 1893, p. 336.

A correction.

— On the mechanism of the upper mandible in the Scolopacidae.

Ibis (Series vi), v, October, 1893, pp. 563-565, figs. 1, 2.

This paper is illustrated by figures of the American Woodcock (*Philohela minor*), showing the peculiar elevation of the extremity of its superior mandible during the act of probing the soft ground in search of food. Based in part upon Museum material.

— Taxidermy at the World's Fair.

Forest and Stream, xli, No. 17, October 28, 1893, pp. 359-360, figs. 1-4.

This contribution is illustrated by a number of figures of groups of various animals belonging to the National Museum and exhibited at the World's Columbian Exposition. The fig-

SHUFELDT, ROBERT W.—continued.

ures are reproductions from photographs. Full descriptions of the groups are given, and the taxidermy is favorably commented upon.

— Short studies of some of our owls.

Great Divide, x, No. 3, November, 1893, pp. 33-34, fig. 1.

Illustrated by a figure (from a photograph of a living specimen) of *Megascops asio*. Based in part upon Museum material.

— Nesting of the Flamingo.

Nidologist, 1, No. 3, November, 1893, pp. 33-35, fig. 1.

Comments on the nesting habits of the species. The paper is illustrated by a reproduction of a photograph of the group in the Museum collection.

— Some recent economic and scientific questions in ornithology.

Science, xxii, No. 562, November 10, 1893, pp. 255-256.

— Relics of Sitting Bull.

Great Divide, x, No. 4, December, 1893, p. 69, figs. 1, 2.

Illustrated by a photograph of the chief, and a figure of his scalp lock, which latter was obtained after his death.

— The study of natural history.

Great Divide, x, No. 4, December, 1893, pp. 89-90.

— Instinct versus reason.

Pop. Sci. News, xxvii, No. 12, December, 1893, p. 189.

— What is a salamander?

Forest and Stream, xli, No. 23, December 9, 1893, pp. 491-492, fig. 1.

A figure of the "tiger salamander" is given. Copied from a photograph of a living specimen. Based upon Museum material.

— Bluebirds in December.

Forest and Stream, xli, No. 24, December 16, 1893, p. 519.

— The Ivory-billed Woodpecker.

Am. Farmer, No. 48, December 15, 1893, p. 1, fig. 1.

This paper is based in part upon Museum material.

— On remounting the specimen of the Great Auk.

Nidologist, 1, No. 4, December, 1893, pp. 49-51, figs. 1-3.

Illustrated by three figures taken from photographs of the U. S. National Museum specimen of the Great Auk (*Plautus impennis*). The remounting was done at the taxidermic workshops of the Museum, and was undertaken in order to improve the attitude and appearance of the specimen. The figures show the bird both before and after remounting.

SHUFELDT, ROBERT W.—continued.

Night Hawks and Whip-poor-wills.

Pop. Sci. Monthly, XLIV, No. 3, January, 1894, pp. 306-313, figs. 1, 2.

This paper is based in part upon Museum material.

— On the taxonomy of the Swifts and Humming-birds: A rejoinder.

Ibis (Series VI), VI, No. 21, January, 1894, pp. 32-39.

This paper is based in part upon Museum material.

— More about Audubon, the naturalist.

Great Divide, XI, No. 2, February, 1894, p. 50, fig. 1.

Gives a photographic copy of the letter written by J. J. Audubon to Richard Harlan, of Philadelphia, wherein the former announces the discovery of a new hawk, which he describes and names Harlan's Hawk (*Buteo Harlani*). This original letter is owned by Dr. Shufeldt, he having received it from Lucy Audubon, the wife of the ornithologist.

— On the coloration of the Ruffed Grouse.

Science XXIII, No. 573, January 26, 1894, pp. 48-49.

This paper is based upon Museum material.

— Note on the shoulder girdle of the Man-o'-war Bird.

Science XXIII, No. 573, January 26, 1894, p. 50.

It is stated that the scapulæ in the skeleton of *Fregata* do not fuse with the coracoids in the adults, as announced by Newton in his Dictionary of Birds (Part I, pp. 293-294).

This paper is based upon Museum material.

— Shrikes.

Great Divide, XI, No. 3, March, 1894, p. 84, 1 fig.

A figure of the "Northern Shrike" is given.

This paper is based upon Museum material.

— Zoological myths.

Great Divide, XI, No. 3, March, 1894, p. 84.

— Nesting habits of the Hornbills.

Nidologist, I, No. 6, February, 1894, pp. 81-83, fig. 1.

Illustrated by a copy of a photograph of a group in the Department of Birds, U. S. National Museum.

— Shedding horns by Antelope.

Great Divide, XI, No. 4, April, 1894, p. 105, 1 fig.

— The American Osprey.

Great Divide, XII, No. 4, April, 1894, pp. 105-106, 2 figs.

Illustrated by a drawing of the head of *Pandion*, and a copy of a photograph giving an example of the Osprey's nest in nature, with the parent bird in the same tree. Based in part upon Museum material.

SHUFELDT, ROBERT W.—continued.

Notes on photographing a live specimen of Gambel's Partridge.

Auk, XI, No. 2, April, 1894, pp. 128-130, pls. III-V.

— Random notes on some of the parasites of birds.

Auk, XI, No. 2, April, 1894, pp. 186-189, 1 fig.

The figure given shows the author's improvised apparatus and method of making microphotographs of parasites found upon birds.

This paper is based in part upon Museum material.

— Chapman on the birds of the island of Trinidad.

Am. Naturalist, XVIII, No. 328 April, 1894, pp. 332-333.

A review of Frank M. Chapman's paper "On the birds of the Island of Trinidad" (*Bull. Am. Mus. Nat. Hist.*, VI, Art. I, April, 1894, pp. 332-333. Author's edition.)

— Bishop Barry, on vivisection.

Religio-Philosophical Journ. (New Series), 49, No. 4, April 28, 1894, pp. 770-771.

— Civet Cats and their allies.

Great Divide, XI, No. 5, May, 1894, pp. 122-123, 1 fig.

Illustrated by a reproduction of a photograph of a mounted specimen of *Viverra zangalunga*, in the collection of the National Museum.

— The mounted collection of fish in the U. S. National Museum.

Forest and Stream, XLII, No. 18, May 5, 1894, p. 383, 3 figs.; No. 20, May 19, 1894, p. 425, 3 figs.

The first paper is illustrated by copies of photographs of three species of fishes belonging to the exhibition series of the U. S. National Museum: the Buffalo Fish (*Ictiobus urus*), a Parrot Fish (*Scarus* sp.), and the common Pompano (*Trachynotus carolinus*). Popular accounts of these species are given, with comments upon the making of plaster of paris casts of fishes for museum exhibition purposes.

The second paper is illustrated by half-tone figures of plaster casts of a Skate (*Raja erinacea*), the Bowfin (*Amia calva*), and the large Red Drum (*Sciaenops ocellatus*). These are also in the Museum collection.

— Comparative oology of North American birds.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1892 (1893), pp. 461-493.

This paper was published in separate form in advance of the Report of which it forms a part. It is based in part upon Museum material.

SHUFELDT, ROBERT W.—continued.

Scientific taxidermy for museums. (Based on a study of the United States Government collections.)

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1892 (1893), pp. 369-436, pls. xv-xcvi.

This paper was published in separate form in advance of the Report of which it forms a part. The history and evolution of the art of taxidermy from the earliest times to the present day are presented. All of the different departments of the science are dwelt upon; as, modeling, casting, and the use of accessories. The various aids to taxidermy are referred to, in some cases quite in detail, and the education of the scientific taxidermist has not been neglected. Both vertebrates and invertebrates have received the author's attention, and the most approved methods of preserving them for museum exhibition are described with more or less thoroughness. Over eighty full-page plates illustrate the work. For the most part these are reproductions of photographs of groups in the U. S. National Museum, but they also illustrate groups in other institutions, as in the British Museum and the American Museum of Natural History, New York City. Examples are given of bad taxidermy, and there are numerous illustrations of living animals, showing the value of photography to the taxidermist in studying the natural attitudes of animals.

— The Mantis.

Great Divide, xi, No. 6, June, 1894, p. 145, 1 fig.

An account of the habits of the Mantidæ, but especially of the common form, *Stagmomantis carolina*, of which species and its egg-masses figures are given.

This paper is based in part upon Museum material.

— Lectures on biology. No. 1. [Read before the Catholic University of America.] Its history and present domain.

Am. Field, xli, No. 26, June 30, 1894, pp. 610-612.

The lectures comprising this course (four in number) were reported in the *American Field*, and afterwards published in pamphlet form. The collections of the National Museum were frequently consulted in connection with their preparation.

SIMPSON, CHARLES TORREY. The molluscan fauna of the Galapagos Islands.

Am. Naturalist, xxviii, No. 327, March, 1894, pp. 255-257.

This is a review of a paper published by Dr. R. E. C. Stearns in the *Proceedings of the National Museum* (Vol. xvi, 1893, No. 942, pp. 353-450).

— On some fossil Unios and other fresh-water shells from the drift at To-

SIMPSON, CHARLES TORREY—cont'd.

ronto, Canada, with a review of the distribution of the Unionidæ of north-eastern North America.

Proc. U. S. Nat. Mus., xvi, No. 952, October 25, 1893, pp. 591-595.

This paper enumerates the species found in the deposit in question, and points out that a number of them are Mississippi Valley forms, which may have penetrated to this region during a temporary recession of the glacial ice cap, and were permanently driven out on the return of the ice. They are not found at present among the fauna of the Atlantic drainage.

— Notes on collecting shells in Jamaica.

Nautilus, vii, No. 10, February, 1884, pp. 110-113.

This paper contains notes on the abundance and distribution of the land shells of Jamaica.

— The sleep of mollusks.

Pop. Sci. Monthly, xlv, No. I, May, 1894, pp. 99-104.

A popular paper on the subject indicated.

SINGELY, J. A. Contributions to the natural history of Texas. Part I.—Texas mollusks.

Fourth Ann. Rep. Texas Geol. Surv., September, 1893, pp. 295-343.

A systematic list of the Mollusca of Texas, with notes. The critical species were identified for Mr. Singely at the National Museum.

SMITH, HUGH M. Notes on two hitherto unrecognized species of American White fishes.

Bull. U. S. Fish Com., xiv, 1894, pp. 1-13.

This paper is based upon Museum material.

(See also under WILLIAM C. KENDALL.)

SMITH, JOHN B. Smithsonian Institution. | United States National Museum. | - | Bulletin | of the | United States National Museum. | No. 44. | Catalogue of the Lepidopterous Superfamily Noctuidæ found in Boreal America. | By | John B. Smith, Sc. D., | Professor of Entomology in Rutgers College. | - | Washington: | Government Printing Office. | 1893.

8vo., pp. 1-424.

This work is based upon Museum material.

STANTON, TIMOTHY W. The Colorado formation and its invertebrate fauna.

Bull. U. S. Geol. Surv., No. 106, 1893 (March, 1894), pp. 1-268, pls. 1-XLIV.

This paper is based upon material belonging to the National Museum, a portion of it having been collected by the U. S. Geological Survey.

STANTON, TIMOTHY W.—continued.

The Columbian Exposition—Notes on some Mesozoic and Tertiary exhibits.

Am Geologist, XIII, April 1894 pp. 289-290.

This article relates to the exhibit made by the U. S. Geological Survey, which is now the property of the Museum.

(See also under J. S. DILLER.)

STEARNS, ROBERT EDWARDS CARTER.

On recent collections of North American land, fresh-water, and marine shells received from the U. S. Department of Agriculture.

Proc. U. S. Nat. Mus., XVI, No. 971, February 9, 1894, pp. 743-755.

This paper is devoted to notes on the distribution, station, etc., of the species enumerated.

— *Triodopsis* + *Mesodon*—distribution, etc.

Nautilus, VIII, No. 1, May, 1894, pp. 6-8.

This paper discusses the geographical distribution of the forms mentioned.

— *Urosalpinx cinereus* in San Francisco Bay.

Nautilus, VIII, No. 2, June, 1894, pp. 13-14.

— Preliminary report on the molluscan species collected by the United States Eclipse Expedition to West Africa in 1889-90.

Proc. U. S. Nat. Mus., XVI, No. 940, September 28, 1893, pp. 317-339.

— On rare or little-known mollusks from the west coast of North and South America, with descriptions of new species.

Proc. U. S. Nat. Mus., XVI, No. 941, September 28, 1893, pp. 341-352.

— Scientific results of explorations by the U. S. Fish Commission steamer *Albatross*. No. xxv.—Report on the mollusk-fauna of the Galapagos Islands, with descriptions of new species.

Proc. U. S. Nat. Mus., XVI, No. 942, September 29, 1893, pp. 353-450.

STEJNEGER, LEONHARD. Description of a new species of blind snake (Typhlopidae), from the Congo Free State.

Proc. U. S. Nat. Mus., XVI, No. 969, February 5, 1894, pp. 709-710.

Typhlops praecularis is described as a new species.

— On some collections of reptiles and batrachians from east Africa and the adjacent islands, recently received from

STEJNEGER, LEONHARD—continued.

Dr. W. L. Abbott and Mr. William Astor Chanler, with descriptions of new species.

Proc. U. S. Nat. Mus., XVI, No. 970, February 7, 1894, pp. 711-741.

In the introduction there are given lists of the species occurring in the Seychelle Archipelago and in the islands of Gloriosa and Aldabra. The following new species and subspecies are described: *Diplodactylus inexpectatus*, *Phelsuma Abbotti*, *Eremias sexteniata*, *Eremias Hoehneli*, *Mabuaya Chanleri*, *Ablepharus gloriosus*, *Typhlops mandensis*, *Simocephalus Chanleri*, *Causus nasalis*, *Hypogeophis alternans*.

— Description of a new lizard (*Verticaria Beldingi*), from California.

Proc. U. S. Nat. Mus., XVII, No. 977, May 4, 1894 pp. 17-18.

— On the status of the Gray Shrike collected by Captain Blakiston in Yezo, Japan.

Proc. U. S. Nat. Mus., XVI, No. 931, July 6, 1893, pp. 217-218.

Considered to be *Lanius sibiricus* (Bodganow).

— Notes on a third installment of Japanese birds in the Science College Museum, Tokyo, Japan, with descriptions of new species.

Proc. U. S. Nat. Mus., XVI, No. 957, October 30, 1893, pp. 615-638.

Notes on 44 species, of which *Estrelata longirostris*, *Columba Taozanowskii*, *Accipiter pallens*, *Locustella hondoensis*, and *Emberiza ciopsis Ijima* are described as new.

— Remarks on Japanese Quails.

Proc. U. S. Nat. Mus., XVI, No. 974, February 13, 1894, pp. 765-769.

Notes on specimens of *Coturnix coturnix* and *C. japonica* in the U. S. National Museum collection, apropos of Mr. W. R. Ogilvie-Grant's paper entitled "Notes on the genus *Coturnix*" (*Ann. Mag. Nat. Hist.* (6), x, 1892, pp. 166-173).

— Report on the Department of Reptiles and Batrachians in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 215-217.

STONE, WITMER. A revision of the genus *Anous*.

Proc. Acad. Nat. Sci. Phila., 1894, pp. 115-118.

Revises the nomenclature and synonymy of the genus, and gives a new name to one species (*A. atrofuscus*), which had been wrongly referred to *A. leucicapillus*, Gould.

This paper is based in part upon Museum material.

STONE, WITMER—continued.

A review of the old world Ralline.

Proc. Acad. Nat. Sci. Phila., 1894, pp. 130-149.

Being "impressed with the confusion which exists in regard to the synonymy of the old world members of the family [Rallinae], more especially with reference to the generic position of many of the species and the limitations of the several genera," Mr. Stone gives a brief but very careful and altogether excellent review of the subject, the result of which is to place the classification and generic nomenclature of the Rallinae in a far more satisfactory condition than previously existed.

This paper is based in part upon Museum material.

STUDER, THÉOPHILE. Reports on the dredging operations off the west coast of Central America, to the Galapagos, to the west coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U. S. Fish Commission steamer *Albatross*, during 1891, Lieut. Commander Z. L. Tanner, U. S. N., commanding. x. Note Préliminaire sur les Alcyonaires.

Bull. Mus. Comp. Zool., xxv, No. 5, January, 1894, pp. 53-69.

Enumerates 34 species, of which 2 are Alcyonacea, 14 Pennatulacea, 1 Scleraxonia, and 17 Holaxonia. Nineteen of these species are new to science.

This paper is based upon material which will become the property of the Museum.

TEST, REDERICK CLEVELAND. The "Gopher Frog."

Science, xxii, No. 549, August 11, 1893, p. 75.

Descriptive note on *Rana areolata cesopus*, with remarks on its distribution and habits.

TRUE, FREDERICK W. Description of a new species of fruit bat, *Pteropus aldabrensis*, from Aldabra Island.

Proc. U. S. Nat. Mus., xvi, No. 948, advance sheet, July 14, 1893, pp. 533-534.

A new fruit bat discovered by Dr. W. L. Abbott.

— Notes on a small collection of mammals from the Tana River, east Africa, with descriptions of new species.

Proc. U. S. Nat. Mus., xvi, No. 954, October 25, 1893, pp. 601-603.

Notes on the collection of Mr. Chanler and Lieutenant von Höhnel, with a description of a new dormouse, *Eliomys parvus*, and a new mouse, *Mus tana*.

TRUE, FREDERICK W.—continued.

Description of a new species of mouse (*Sitomys decolorus*), from Central America.

Proc. U. S. Nat. Mus., xvi, No. 963, February 5, 1894, pp. 689-690.

— On the relationships of Taylor's Mouse, *Sitomys Taylora*.

Proc. U. S. Nat. Mus., xvi, No. 972, February 7, 1894, pp. 757-758.

This mouse is regarded as the type of a new subgenus, described under the name of *Baiomys*.

— Notes on mammals of Baltistan and the Vale of Kashmir, presented to the National Museum by Dr. W. L. Abbott.

Proc. U. S. Nat. Mus., xvii, No. 976, May 8, 1894, pp. 1-16.

An account of the various mammals obtained by Dr. Abbott, with descriptions of a new form of the Rhesus monkey, *Macacus rhesus villosus*, a new race of the long-tailed field mouse, *Mus arianus griseus*, and three new species of Voles, *Arvicola fertilis*, *A. montosa*, and *A. albicauda*. A list of the mammals of Kashmir, compiled from various authorities, is added.

— Diagnoses of new North American mammals.

Proc. U. S. Nat. Mus., xvii, No. 999, advance sheet, April 26, 1894, pp. 241-243.

Description of a new race of Abert's squirrel, *Sciurus Aberti concolor*; a new genus of American moles, *Parascalops*, based on *Scalops Breweri*, Bachman; a new species of *Scapanus*, *S. dilatatus*, from Oregon; a new genus of mice, *Mictomys*, with *M. innuitus*, from Labrador, as a new species; also a new species of lemming, *Myodes nigripes*, from Alaska.

— Diagnoses of some undescribed wood rats (genus *Neotoma*) in the National Museum.

Proc. U. S. Nat. Mus., xvii, No. 1006, advance sheet, June 27, 1894, pp. 353-355.

Diagnoses of *Neotoma splendens*, *N. macrotis simplex*, *N. venusta*, and *N. occidentalis fusca*.

— Report on the Department of Mammals in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 199-205.

VASEY, GEORGE. Notes on some Pacific Coast grasses.

Contrib. U. S. Nat. Herbarium, i, No. 8, October 31, 1893, pp. 265-266.

This paper consists chiefly of notes on some of Dr. Thurber's California grasses.

— Description of new or noteworthy grasses from the United States.

Contrib. U. S. Nat. Herbarium, i, No. 8, October 31, 1893, pp. 267-280.

Thirty three species are described as new.

VASEY, GEORGE—continued.

Description of new grasses from Mexico.

Contrib. U. S. Nat. Herbarium, I, No. 8, October 31, 1893, pp. 281-285, pl. XIX.

Fifteen new species are described and one is illustrated.

— Report on the Department of Botany in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 251-253.

WALCOTT, CHARLES DOOLITTLE. Notes on the Cambrian rocks of Pennsylvania, from the Susquehanna to the Delaware.

Am. Journ. Sci., XLVII, 1894, pp. 37-41.

Description of discoveries made in relation to the Cambrian rocks and faunas, in continuation of the study of the Lower Paleozoic formations of southeastern Pennsylvania. The principal result was the discovery of the *Olenellus*, or Lower Cambrian fauna, in the Reading quartzite, as it practically completes the correlation of the South Mountain, Chickis, and Reading quartzites of Pennsylvania, and establishes the correctness of the early correlations of Maclure, Eaton, Emmons, and Rogers. The *Olenellus* fauna was also discovered in the limestone in the eastern portion of Lancaster County, which compels the reference of the so-called Potsdam rocks of Chester County, with their superjacent limestones, to the Lower Cambrian. Details are given also of the occurrence of the quartzites and limestones and their included faunas.

— Paleozoic intra-formational conglomerates.

Bull. Geol. Soc. Am., v, February, 1894, pp. 191-198, pls. 5-7.

An intra-formational conglomerate is one formed within a geologic formation, of material derived from and deposited within that formation. Illustrations are given of the occurrence of such conglomerates in Canada, Vermont, Pennsylvania, and Tennessee, and a number of plates accompany the paper showing their mode of occurrence.

The origin of the Paleozoic intra-formational conglomerates is described as follows:

"The relation of the bedded limestones to the superjacent conglomerates proves that the calcareous mud, which was subsequently consolidated into the limestones, solidified soon after deposition. This is shown by the presence in the conglomerate of rounded pebbles and angular fragments of limestone with sharp clear-cut edges. The presence of the conglomerates above the limestone beds, from some portion of which they were derived, leads the author to believe that the sea bed was raised in ridges or domes above the sea level, and thus subjected to the action of the seashore ice, if present, and the aerial agents of erosion. From

WALCOTT, CHARLES DOOLITTLE—continued.

the fact that the limestones upon which the conglomerates rest rarely, if ever, show traces of erosion where the conglomerates come into contact with them, the inference is that the débris worn from the ridges was deposited in the intervening depressions beneath the sea. In the case of the conglomerates of the Wilhite slates of Tennessee, it is exceptional to find a bedded limestone above them, but within the Lower Cambrian of Pennsylvania and New York the conglomerates are interbedded in the limestones. * * *

"The history of the Appalachian sedimentation and mountain-building proves that a more or less constant movement was taking place from Algonkian time to the close of the Paleozoic. This movement was at times greatly prolonged, and resulted in marked topographic features. More frequently the minor movements produced local effects, and some of them resulted in the formation of the conglomerates described."

— Note on some appendages of the Trilobites.

Proc. Biol. Soc. Wash., IX, March 30, 1894, pp. 89-97, pl. I.

A brief description of some recent discoveries in relation to the thoracic limbs of *Triarthrus Becki*, and portions of the cephalic appendages, in which is shown the marked difference between the appendages of *Calymene senaria* and *T. Becki*.

— On the occurrence of *Olenellus* in the Green Pond Mountain series of northern New Jersey, with a note on the conglomerates.

Am. Journ. Sci., XLVII, 1894, pp. 309-311.

Description of the discovery of *Olenellus* in the limestones which had theretofore been referred to the magnesian limestones of the Pennsylvania and New York section. Attention is called to the occurrence of several horizons of the conglomerates in the Green Pond Mountain region, viz: (1) The Macopin Lake, of Lower Cambrian age; (2) the Green Pond, Kanouse, and Copperas Mountain conglomerate, Ordovician or Silurian; (3) the white conglomerate west of Greenwood Lake, etc.; (4) The narrow belt of conglomerate beneath the shales carrying the Hamilton fauna, on Greenwood Lake, Lower Devonian; (5) the massive Devonian conglomerate of Skunne-munk Mountain, which appears to extend to the southwest into Belle Vale and Bear Fort mountains.

— Report on the Department of Paleozoic Invertebrate Fossils in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 245-248.

WARD, LESTER F. [Two letters relating to the fossil plant *Winchellia triphylla*, Lesq.]

Am. Geologist, XII, October, 1893, pp. 211-213.

These letters were written to Prof. N. H. Winchell, April 12 and May 18, 1893, and were published by him as part of the history of the plant in question, which is described and figured in the same paper, from Professor Lesquereux's original manuscript and drawings.

— Frost plants.

Science, XXIII, February 2, 1894, p. 66.

A short note on the observation, by Mr. William Hunter, of the frost crystals on *Cunila mariana*, many years prior to that of the writer.

— Fossil cycadean trunks of North America, with a revision of the genus *Cycadeoidea*.

Proc. Biol. Soc. Wash., IX, April 9, 1894, pp. 75-88.

A brief history of the occurrence of cycadean trunks in North American strata precedes the revision and synonymy of the genus *Cycadeoidea*, to which all the American forms are referred. The revision is chiefly based on the recent studies of Count Solms-Laubach.

— Principes et méthodes d'étude de corrélation géologique au moyen des plantes fossiles.

Compte rendu de la cinquième Session du Congrès Géologique International, Washington, 1891 (1894), pp. 97-109.

This paper was read before the Congress on August 29, 1891. It was published in English in the *American Geologist* for January, 1892.

— The Cretaceous rim of the Black Hills.

Journ. Geol., II, No. 3, April-May, 1894, pp. 250-266.

Gives the results of a field reconnaissance made in September, 1893, in that part of Fall River County, S. Dak., in which valuable specimens of cycadean trunks had been collected. The stratigraphy was carefully worked out and the horizon determined to be Cretaceous instead of Dakota Group, as had been reported by other geologists.

— Report on the Department of Fossil Plants in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 255-257.

WATKINS, J. ELFRETH. Report on the Section of Transportation and Engineering in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), pp. 163-170.

WATKINS, J. ELFRETH—continued.

Catalogue of the Exhibit of the Pennsylvania Railroad Company at the World's Columbian Exposition | Under the direction of | Theo. N. Ely, Chief of Motive Power, | J. Elfreth Watkins, Special Agent in charge of the exhibit. | Chicago, 1893.

Second edition, pp. 1-158, with plates.

This catalogue is arranged with special reference to the early history and development of the art of transportation in the thirteen States of the Union in which the lines of the Pennsylvania Railroad Company are located.

— [Address describing the silver memorial vase presented to Willard A. Smith, chief of the department of transportation exhibits, World's Columbian Exposition.]

Railway Review, XXXIV, June 9, 1894, pp. 326-327, 5 figs.

The above address (delivered at the presentation) forms a portion of an article in the *Railway Review* entitled "The silver memorial vase of the department of transportation, World's Columbian Exposition." The vase is very artistic and illustrates the development of the art of transportation. Many of the designs were prepared from drawings of objects in the collection of the National Museum. This address was also published in pamphlet form.

WEBB, DE WITT. The shell heaps of the east coast of Florida.

Proc. U. S. Nat. Mus., XVI, No. 966, April 9, 1894, pp. 695-698, pls. LXXVIII-LXXXIV.

The National Museum possesses specimens obtained from these mounds.

WEED, CLARENCE M. A descriptive catalogue of the harvest spiders (Phalangida) of Ohio.

Proc. U. S. Nat. Mus., XVI, No. 950, October 25, 1893, pp. 543-563, pls. LVII-LXIX, fig. 1.

This paper is based upon Museum material.

WHITE, CHARLES ABIATHAR. The relation of biology to geological investigation.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1892 (1893), pp. 245-368, pl. xiv.

This paper was published in separate form in advance of the Report of which it forms a part.

— Report on the Department of Mesozoic Fossils in the U. S. National Museum, 1891.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1891 (1892), p. 249.

— The relation of the sounds of fog signals to other sounds.

Science, XXIII, No. 574, Feb. 2, 1894, pp. 59-62.

WHITE, CHARLES ABIATHAR—cont'd.

Memoir of Amos Henry Worthen.

Biographical Memoirs of the National Academy of Sciences, III, pp. 339-362.

This paper was read before the National Academy of Sciences, November, 1893.

WILSON, THOMAS. Eighth International Congress of Americanists, Paris, 1890.

Am. Naturalist, XXVII, No. 320, August, 1893, pp. 755-761.

Notes on the papers read before the congress, among which the following are referred to:

The history and geography of America.—The origin of the name America, Scandinavian discoveries in America, The culture of the banana in America, Items in the life of Columbus, etc.

American anthropology.—Plurality of types in America, Paleolithic age possible in America, The earliest American, Cliff-dwellers of the Sierra Madre, Dental deformation among American Indians, Fuegan anthropology, American archæology, Textile decoration of prehistoric pottery in Russia and America, Chronological classification of prehistoric monuments in America, Archæology in Central America.

Ethnography.—Hunt of the Sacred Eagles among the Zúñis; Mexico and Guatemala.

— Ninth International Congress of Americanists.

Am. Naturalist, XXVII, No. 321, September, 1893, pp. 838-840.

Describes the magnificent display at the Government fête at Huelva, Spain, in commemoration of the four hundredth anniversary of the discovery of America by Columbus. The Ninth International Congress of Americanists was held in connection with this celebration.

— The Exposición Historicó-Americana, Madrid, Spain, 1892.

Am. Naturalist, XXVII, No. 321, September, 1893, pp. 840-843; No. 322, October, 1893, pp. 907-912.

Descriptive of the Palace, the Biblioteca, and Belle Artis, just completed in Madrid, which were first used on the occasion of the Exposition.

— The International Congress of Prehistoric Archæology and Anthropology, at Moscow, Russia, August 22 and 23, 1892.

Am. Naturalist, XXVII, No. 323, November ber, 1893, pp. 1024-1025.

In this article are noted the grand divisions of the questions discussed, as follows: Geology and paleontology in their relation to primitive man; Prehistoric archæology; Kourganes and Gordichtsches; Anthropology; Prehistoric ethnography.

— Minute stone implements from India.

Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1892 (1893), pp. 455-460. pls. CII, CIII.

A description of minute stone implements from caverns in the Vindhya hills or mountains

WILSON, THOMAS—continued.

of central or northwestern India, discovered and collected by Mr. A. C. Carlisle, and purchased by the National Museum from Mr. Charles Seidler, of London. They are distinguished from other prehistoric implements by their remarkably small size. Hundreds of them are wrought by chipping almost infinitesimal flakes into various forms—needle-like, triangular, quadrilateral, trapezoidal, and rhomboidal—while the most delicate and finely finished are in the form of a crescent, the most of them with sharp cutting points or edges. The material is jasper, chert, hornstone, flint, agate, and chalcedony. Their use is not known.

This paper was published as a separate, in advance of the Report of which it forms a part.

— Primitive industry.

Rep. Smithsonian Inst., 1892 (1893), pp. 521-534.

A description of the earliest implements of industry known to have been made by man, thence continuing in gradations through the various epochs to the beginnings of history; the differences between the Paleolithic and Neolithic ages; observations of foreign archæologists upon the gravel beds at Trenton, and an argument favoring the genuineness of the rude stone implements found in that deposit by Dr. Abbott.

— Report on the Department of Prehistoric Anthropology in the U. S. National Museum, 1891.

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WOODWORTH, W. McM. Reports on the dredging operations of the west coast of Central America to the Galapagos, to the west coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U. S. Fish Commission steamer *Albatross* during 1891, Lieut. Commander Z. L. Tanner, U. S. N., commanding. ix. Report on the Turbellaria.

Bull. Mus. Comp. Zool., XXV, No. 4, January, 1894, pp. 49-52, pl. 1.

Three species, representing as many genera, were taken. Two of the species are probably new. *Planocera pellucida* is here first recorded from the North Pacific, and its occurrence gives to the species the widest distribution of any pelagic Planarian.

This paper is based upon material which will become the property of the Museum.

LIST OF NAMES OF INDIVIDUALS, WITH ADDRESSES, INCLUDED IN THE FOREGOING
BIBLIOGRAPHY.

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SUPPLEMENT A.

LIST OF NEW GENERA AND SUBGENERA DESCRIBED IN PUBLICATIONS OF THE U. S. NATIONAL MUSEUM ISSUED DURING THE FISCAL YEAR ENDING JUNE 30, 1894.

[An asterisk indicates that the type specimen is not in the National Museum.]

- Acanthoscelio.* Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 236.
- Ampulicomorpha.* Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 79.
- Aradophagus. Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 166.
- Baiomys. Subgen. nov. True. (Mamm.) *Proc. U. S. N. M.*, XVI, 1893, No. 972 p. 758.
- Bocchus.* Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 91.
- Cacus.* Riley. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 223.
- Calliscelio. Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 218.
- Ceratobæus.* Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 175.
- Ceratopria.* Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 428.
- Chitonanthus. McMurrich. (Actin.) *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 189.
- Chromoteleia. Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 219.
- Cœlopelta. Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 289.
- Cradactis. McMurrich. (Actin.) *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 197.
- Cre mastobæus. Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 228.
- Cryptophrys. M. J. Rathbun. (Decap.) *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 250.
- Ctenoiulus. Cook. (Myr.) *Proc. U. S. N. M.*, XVI, 1893, No. 968, p. 704.
- Cymbactis. McMurrich. (Actin.) *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 174.
- Dissolcus. Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 164.
- Dis somphalus.* Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 41.
- Ericerus. M. J. Rathbun. (Decap.) *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 223.
- Ereileptus. M. J. Rathbun. (Decap.) *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 226.
- Erimetopus. M. J. Rathbun. (Decap.) *Proc. U. S. N. M.*, XVII, 1894, No. 980, p. 26.
- Eritrissomerus.* Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 298.
- Halcurias. McMurrich. (Actin.) *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 142.
- Hemilexodes.* Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 399.
- Hoplogryon.* Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 200.
- Hoplopria.* Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 388.
- Hoptoteleia.* Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 227.
- Lælius. Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 50.
- Lapitha. Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 222.
- Lepteces. M. J. Rathbun. (Decap.) *Proc. U. S. N. M.*, XVI, 1893, No. 927, p. 83.
- Machomenus. Marx. (Arach.) *Proc. U. S. N. M.*, XVI, 1893, No. 951, p. 589.
- Mictomys. True. (Mamm.) *Proc. U. S. N. M.*, XVII, 1894, No. 999, p. 242.
- Myonanthus. McMurrich. (Actin.) *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 151.
- Myrmecopria.* Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 446.
- Neoceraphron.* Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 136.
- Œdiplax. M. J. Rathbun. (Decap.) *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 241.
- Opisthacantha.* Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 221.
- Opisthopus. M. J. Rathbun. (Decap.) *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 251.

- Oractis*. McMurrich. (Actin.) *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 138.
- Parascalops*. True. (Mamm.) *Proc. U. S. N. M.*, XVII, 1894, No. 999, p. 242.
- Phanopria*.^{*} Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 436.
- Phorbas*.^{*} Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 90.
- Plagiogrammus*. T. H. Bean. (Pisc.) *Proc. U. S. N. M.*, XVI, 1893, No. 967, p. 699.
- Pycnanthus*. McMurrich. (Actin.) *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 172.
- Sceliomorpha*.^{*} Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 239.
- Scleroplax*. M. J. Rathbun. (Decap.) *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 250.
- Thyrolambus*. M. J. Rathbun. (Decap.) *Proc. U. S. N. M.*, XVII, 1894, No. 986, p. 83.
- Trichopria*. Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 431.
- Trissolcus*. Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 161.
- Tropidopria*.^{*} Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 416.
- Tropidopsis*. Ashmead. (Hym.) *Bull. U. S. N. M.*, No. 45, 1893, p. 402.

SUPPLEMENT B.

LIST OF NEW SPECIES AND SUBSPECIES DESCRIBED IN PUBLICATIONS OF THE U. S. NATIONAL MUSEUM ISSUED DURING THE FISCAL YEAR ENDING JUNE 30, 1894.

[An asterisk indicates that the type specimen is not in the National Museum.]

- Ablepharus gloriosus*. Stejneger. (Rept.) Gloriosa Island. *Proc. U. S. N. M.*, XVI, 1893, No. 970, p. 723.
- Acanthoscelio americanus*.^{*} Ashmead. (Hym.) Chapada, Brazil. *Bull. U. S. N. M.*, No. 45, 1893, p. 236.
- Acanthoscelio flavipes*.^{*} Ashmead. (Hym.) Bogota. *Bull. U. S. N. M.*, No. 45, 1893, p. 236.
- Accipiter pallens*.^{*} Stejneger. (Aves.) Province of Hitachi, Japan. *Proc. U. S. N. M.*, XVI, 1893, No. 957, p. 625.
- Acerota cecidomyiæ*. Ashmead. (Hym.) Lancaster, Los Angeles County, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 261.
- Aclista borealis*.^{*} Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 378.
- Aclista californica*.^{*} Ashmead. (Hym.) Santa Cruz Mountains, California. *Bull. U. S. N. M.*, No. 45, 1893, p. 378.
- Aclista conica*.^{*} Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 377.
- Aclista floridana*.^{*} Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 378.
- Aclista missouriensis*.^{*} Ashmead. (Hym.) St. Louis, Mo. *Bull. U. S. N. M.*, No. 45, 1893, p. 377.
- Aclista rufa*.^{*} Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 376.
- Aclista rufescens*.^{*} Ashmead. (Hym.) Santa Cruz Mountains, California. *Bull. U. S. N. M.*, No. 45, 1893, p. 376.
- Aclista rufopetiolata*.^{*} Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 376, fig. 4 of Pl. XV.
- Aclista rugosopetiolata*.^{*} Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 377.
- Acoloides bicolor*.^{*} Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 172.
- Acoloides Howardii*.^{*} Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 171.
- Acoloides melleus*.^{*} Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 172.
- Acoloides seminiger*.^{*} Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 173.
- Acoloides subapterus*.^{*} Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 173.
- Acolus xanthogaster*.^{*} Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 174.

- Acolus Zabriskiei*. Ashmead. (Hym.) Flatbush, Long Island. *Bull. U. S. N. M.*, No. 45, 1893, p. 175, fig. 7 of Pl. XV.
- Acropieta flavicauda*.* Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 354, fig. 3 of Pl. XIV.
- Acropieta subaptera*.* Ashmead. (Hym.) Marquette, Mich. *Bull. U. S. N. M.*, No. 45, 1893, p. 354.
- Actaea Palmeri*. M. J. Rathbun. (Decap.) Rodriguez Creek, Fla. *Proc. U. S. N. M.*, XVII, 1894, No. 986, p. 85.
- Actinernus plebeius*. McMurrich. (Actin.) Off Lota, Chile. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 166, figs. 42-45 of Pl. XXIV.
- Actinostola excelsa*. McMurrich. (Actin.) Off the coast of Patagonia. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 170, figs. 53-56 of Pl. XXVI.
- Actinostola pergamentacea*. McMurrich. (Actin.) Off Gulf of St. George, Patagonia. *Proc. U. S. N. M.*, X, VI, 1893, No. 930, p. 171, figs. 57 and 58 of Pl. XXVII and figs. 59-63 of Pl. XXVII.
- Adamsia* (?) *involvens*. McMurrich. (Actin.) Off Cape San Francisco, Ecuador. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 182, figs. 82 and 83 of Pl. XXIX and fig. 85 of Pl. XXX.
- Æstrelata longirostris*.* Stejneger. (Aves.) North Pacific Ocean, Province of Matsun, Japan. *Proc. U. S. N. M.*, XVI, 1893, No. 957, p. 618.
- Amblyaspis californicus*. Ashmead. (Hym.) Marin County, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 268.
- Amblyaspis minutus*. Ashmead. (Hym.) Washington, D. C., and St. Louis, Mo. *Bull. U. S. N. M.*, No. 45, 1893, p. 269.
- Amblyaspis occidentalis*.* Ashmead. (Hym.) Riley County, Kans. *Bull. U. S. N. M.*, No. 45, 1893, p. 267.
- Amblyaspis petiolatus*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 268.
- Amblyaspis rugiceps*.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 269.
- Ampulicomorpha confusa*. Ashmead. (Hym.) California. *Bull. U. S. N. M.*, No. 45, 1893, p. 80, fig. 1 of Pl. V.
- Anasimus rostratus*. M. J. Rathbun. (Decap.) Northwest of Cerros Island, off Lower California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 227.
- Anectata californica*.* Ashmead. (Hym.) Santa Cruz Mountains, California. *Bull. U. S. N. M.*, No. 45, 1893, p. 381.
- Anectata georgica*.* Ashmead. (Hym.) Georgia. *Bull. U. S. N. M.*, No. 45, 1893, p. 382.
- Anectata polita*.* Ashmead. (Hym.) Westcliffe, Colo. *Bull. U. S. N. M.*, No. 45, 1893, p. 382.
- Anemonia* (?) *inequalis*. McMurrich. (Actin.) Pichilingue Bay, Lower California. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 149, figs. 114 and 115 of Pl. XXXIV.
- Anemonia variabilis*. McMurrich. (Actin.) Off Gulf of San Matias, Patagonia. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 147, figs. 18 and 19 of Pl. XXI.
- Aneurhynchus floridanus*.* Ashmead. (Hym.) Fort George Island, Florida. *Bull. U. S. N. M.*, No. 45, 1893, p. 405, fig. 4 of Pl. XVII.
- Aneurhynchus virginicus*.* Ashmead. (Hym.) Harper's Ferry, W. Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 405.
- Anopedias pentatomus*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 292.
- Anoxus Chittendenii*. Ashmead. (Hym.) Ithaca, N. Y. *Bull. U. S. N. M.*, No. 45, 1893, p. 68, fig. 6 of Pl. IV.
- Anoxus lævis*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 68.
- Anteon minutus*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 97.
- Anteon pallidicornis*.* Ashmead. (Hym.) Utah Lake, Utah. *Bull. U. S. N. M.*, No. 45, 1893, p. 97.
- Anteon politus*.* Ashmead. (Hym.) Toronto, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 96, fig. 2 of Pl. VI.
- Anteon puncticeps*.* Ashmead. (Hym.) Arlington, Va., and Vancouver Island. *Bull. U. S. N. M.*, No. 45, 1893, p. 97.
- Anteon rugosus*.* Ashmead. (Hym.) Illinois. *Bull. U. S. N. M.*, No. 45, 1893, p. 96.
- Anteon unifasciatus*. Ashmead. (Hym.) Biscayne Bay, Florida. *Bull. U. S. N. M.*, No. 45, 1893, p. 95.

- Anteris nigriceps*.^{*} Ashmead. (Hym.) Jacksonville, Fla., and Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 226.
- Anteris virginiensis*. Ashmead. (Hym.) Virginia. *Bull. U. S. N. M.*, No. 45, 1893, p. 225.
- Apenesia coronata*.^{*} Ashmead. (Hym.) Bladensburg. Md. *Bull. U. S. N. M.*, No. 45, 1893, p. 47, fig. 3 of Pl. III.
- Aphanogmus bicolor*.^{*} Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 134.
- Aphanogmus floridanus*.^{*} Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 134.
- Aphanogmus marylandicus*.^{*} Ashmead. (Hym.) Oakland, Md. *Bull. U. S. N. M.*, No. 45, 1893, p. 135.
- Aphanogmus niger*.^{*} Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 133.
- Aphanogmus pallidipes*.^{*} Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 135.
- Aphanogmus varipes*.^{*} Ashmead. (Hym.) Manhattan, Kans. *Bull. U. S. N. M.*, No. 45, 1893, p. 135, fig. 1 of Pl. VII.
- Aphanogmus virginiensis*.^{*} Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 135.
- Aphelopus affinis*.^{*} Ashmead. (Hym.) Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 162.
- Aphelopus albopictus*.^{*} Ashmead. (Hym.) Washington, D. C., and Bladensburg, Md. *Bull. U. S. N. M.*, No. 45, 1893, p. 101.
- Aphelopus rufiventris*.^{*} Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 100.
- Aradophagus fasciatus*. Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 166, fig. 9 of Pl. VII.
- Arvicola albicauda*. True. (Mamm.) Braldu Valley, Baltistan. *Proc. U. S. N. M.*, XVII, 1894, No. 976, p. 12.
- Arvicola fertilis*. True. (Mamm.) Central Kashmir, Pir Panjal and Kaj Nag Mountains, and Krishnagunga Valley. *Proc. U. S. N. M.*, XVII, 1894, No. 976, p. 10.
- Arvicola montosa*. True. (Mamm.) Central Kashmir. *Proc. U. S. N. M.*, XVII, 1894, No. 976, p. 11.
- Aspidium angustipinnatum* Font., var. *montanense*. (Foss. Pl.) Kootanie group, Great Falls, Mont. *Proc. U. S. N. M.*, XV, 1892, No. 918, p. 491, figs. 1 and 1a of Pl. LXXXIV.
- Aspidium monocarpum*. Fontaine. (Foss. Pl.) Kootanie group, Great Falls, Mont. *Proc. U. S. N. M.*, XV, 1892, No. 918, p. 490, figs. 4-6a of Pl. LXXXIII and figs. 3, 3a of Pl. LXXXIV.
- Aspidium montanense*. Fontaine. (Foss. Pl.) Kootanie group, Great Falls, Mont. *Proc. U. S. N. M.*, XV, 1892, No. 918, p. 490, figs. 1-3 of Pl. LXXXII, figs. 2, 3, 3a of Pl. LXXXIII.
- Ateleopterus tarsalis*.^{*} Ashmead. (Hym.) Washington, D. C., and Lafayette, Ind. *Bull. U. S. N. M.*, No. 45, 1893, p. 45.
- Ateleopterus virginiensis*.^{*} Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 45, figs. 1 and 2 of Pl. III.
- Atritomus americanus*.^{*} Ashmead. (Hym.) Odenton, Md. *Bull. U. S. N. M.*, No. 45, 1893, p. 122, fig. 9 of Pl. VI.
- Bæoneura bicolor*.^{*} Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 235.
- Bæus minutus*.^{*} Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 178.
- Bæus niger*. Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 178.
- Bæus piceus*.^{*} Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 179.
- Baryconus œcanthi*. Riley. (Hym.) Lincoln, Nebr. *Bull. U. S. N. M.*, No. 45, 1893, p. 215, fig. 2 of Pl. IX.
- Basalys analis*.^{*} Ashmead. (Hym.) Carolina and Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 445.
- Basalys brevicornis*.^{*} Ashmead. (Hym.) Colorado. *Bull. U. S. N. M.*, No. 45, 1893, p. 446.
- Basalys californica*.^{*} Ashmead. (Hym.) Santa Cruz Mountains, California. *Bull. U. S. N. M.*, No. 45, 1893, p. 446, fig. 7 of Pl. XVIII.
- Basalys fuscipennis*.^{*} Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 444.
- Basalys picipes*.^{*} Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 444.

- Basalys utahensis*.* Ashmead. (Hym.) City Cañon, Utah. *Bull. U. S. N. M.*, No. 45, 1893, p. 444.
- Belyta erythropus*.* Ashmead. (Hym.) Wisconsin. *Bull. U. S. N. M.*, No. 45, 1893, p. 357.
- Belyta frontalis*.* Ashmead. (Hym.) Delaware. *Bull. U. S. N. M.*, No. 45, 1893, p. 356, fig. 4 of Pl. XIV.
- Belyta texana*.* Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 357.
- Bethylus constrictus*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 53.
- Bocchus flavicollis*.* Ashmead. (Hym.) Marquette, Mich. *Bull. U. S. N. M.*, No. 45, 1893, p. 91, fig. 6 of Pl. V.
- Bolocera brevicornis*. McMurrich. (Actin.) North of San Clemente Island, California. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 158, figs. 31-3 of Pl. XXIII.
- Bolocera occidua*. McMurrich. (Actin.) Straits of Magellan and off the coast of Patagonia. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 154, figs. 24-27 of Pl. XXII.
- Bolocera pannosa*. McMurrich. (Actin.) North of San Clemente Island, California. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 156, figs. 28 and 29 of Pl. XXII and fig. 30 of Pl. XXIII.
- Brachynotus* (*Heterograpsus*) *Jouyi*. M. J. Rathbun. (Decap.) Guaymas, Mexico. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 247.
- Brachyphyllum texense*. Fontaine. (Foss. Pl.) Near Glen Rose, Tex. *Proc. U. S. N. M.*, XVI, 1893, No. 934, p. 269, figs. 3-5 of Pl. XXXVIII, and figs. 1 and 1a of Pl. XXXIX.
- Buchanga aldabrana*. Ridgway. (Aves.) Aldabra Island. *Proc. U. S. N. M.*, XVI, 1893, No. 953, p. 597.
- Bulimulus* (*Scutalus*) *Baileyi*. Dall. (Moll.) Cape St. Lucas, Ortiz and Guaymas, Mexico. *Proc. U. S. N. M.*, XVI, 1893, No. 958, p. 640.
- Bulimulus* (*Leptobyrsus*) *Veseyianus*. Dall. (Moll.) Espiritu, Santo Island, Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, p. 645, No. 958, figs. 4, 5 of Pl. LXXI.
- Bulimulus* (*Leptobyrsus*) *Zeledoni*. Dall. (Moll.) Costa Rica. *Proc. U. S. N. M.*, XVI, 1893, No. 958, p. 644, fig. 2 of Pl. LXXI.
- Buthraupis cæruleigularis*. Cherrie. (Aves.) Buena Vista, Costa Rica. *Proc. U. S. N. M.*, XVI, 1893, No. 956, p. 609.
- Cacus cecanthi*.* Riley. (Hym.) Lafayette, Ind. *Bull. U. S. N. M.*, No. 45, 1893, p. 224, fig. 6 of Pl. XVI.
- Callinectes tumidus gladiator*. Benedict. (Decap.) Beyah River, West Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 949, p. 537.
- Calliscelio laticinctus*. Ashmead. (Hym.) St. Vincent, West Indies. *Bull. U. S. N. M.*, No. 45, 1893, p. 219, fig. 7 of Pl. IX.
- Caloteleia Heidemannii*.* Ashmead. (Hym.) Virginia. *Bull. U. S. N. M.*, No. 45, 1893, p. 213, fig. 1 of Pl. IX.
- Caloteleia Marlattii*. Ashmead. (Hym.) Kansas, Illinois, and New Jersey. *Bull. U. S. N. M.*, No. 45, 1893, p. 214.
- Caloteleia striata*. Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 213.
- Cambarus pellucidus Testii*. Hay. (Decap.) Indiana. *Proc. U. S. N. M.*, XVI, 1893, No. 935, p. 285, Pl. XLIV.
- Carcinoplax dentatus*. M. J. Rathbun. (Decap.) Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 243.
- Carpolithus Harveyi*. Fontaine. (Foss. Pl.) Near Glen Rose, Tex. *Proc. U. S. N. M.*, XVI, 1893, No. 934, p. 278, fig. 3 of Pl. XLIII.
- Carpolithus obovatus*. Fontaine. (Foss. Pl.) Near Glen Rose, Tex. *Proc. U. S. N. M.*, XVI, 1893, No. 934, p. 278, fig. 5 of Pl. XLIII.
- Catharus melpomene clarus*. Jouy. (Aves.) Western Mexico. *Proc. U. S. N. M.*, XVI, 1893, No. 975, p. 773.
- Causus nasalis*. Stejneger. (Rept.) Tropical Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 970, p. 735.
- Cephalonomia hyalinipennis*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 49, fig. 5 of Pl. III.
- Ceraphron amplus*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 129.
- Ceraphron auripes*.* Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 125.
- Ceraphron basalis*.* Ashmead. (Hym.) District of Columbia and Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 127.

- Ceraphron californicus*. Ashmead. (Hym.) Folsom, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 127.
- Ceraphron carinatus*. Ashmead. (Hym.) Oakland and Bladensburg, Md., District of Columbia, and Virginia. *Bull. U. S. N. M.*, No. 45, 1893, p. 131.
- Ceraphron flaviscapus*.* Ashmead. (Hym.) Arlington, Va., and District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 130.
- Ceraphron fusciceps*.* Ashmead. (Hym.) District of Columbia and Oakland, Md. *Bull. U. S. N. M.*, No. 45, 1893, p. 125.
- Ceraphron glaber*.* Ashmead. (Hym.) District of Columbia and Bladensburg, Md. *Bull. U. S. N. M.*, No. 45, 1893, p. 130.
- Ceraphron longicornis*.* Ashmead. (Hym.) Fort George Island, Florida. *Bull. U. S. N. M.*, No. 45, 1893, p. 132.
- Ceraphron melanocerus*.* Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 129.
- Ceraphron mellipes*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 131.
- Ceraphron pallidiventris*.* Ashmead. (Hym.) Fort Pendleton, Md. *Bull. U. S. N. M.*, No. 45, 1893, p. 126.
- Ceraphron pedalis*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 130.
- Ceraphron punctatus*. Ashmead. (Hym.) Virginia, Maryland, and District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 127, fig. 2 of Pl. VII.
- Ceraphron salicicola*. Ashmead. (Hym.) Los Angeles, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 128.
- Ceraphron unicolor*.* Ashmead. (Hym.) Cheyenne, Wyo., and Alta, Utah. *Bull. U. S. N. M.*, No. 45, 1893, p. 128.
- Ceratobaeus binotatus*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 176.
- Ceratobaeus cornutus*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 176, fig. 8 of Pl. VIII.
- Ceratopria bifoveolata*.* Ashmead. (Hym.) Harper's Ferry, W. Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 430.
- Ceratopria infuscatipes*.* Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 431, fig. 3 of Pl. XVIII.
- Ceratoprialongiceps*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 429.
- Ceratopria megaplasta*.* Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 430.
- Ceratopria pusilla*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 430.
- Cerianthus* var. *McMurrich*. (Actin.) Cerros Island. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 202, figs. 117-119 of Pl. XXXIV and fig. 120 of Pl. XXXV.
- Cerithium cymatophorum*. Dall. (Moll.) Arctic Siberia. *Proc. U. S. N. M.*, XVI, 1893, No. 946, p. 475, fig. 1 of Pl. LVI.
- Chelogyne canadensis*.* Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 93, fig. 1 of Pl. VI.
- Chelogyne Henshawi*.* Ashmead. (Hym.) Milton, Mass. *Bull. U. S. N. M.*, No. 45, 1893, p. 93.
- Chionocetes Tanneri*. M. J. Rathbun. (Decap.) Pacific Coast from Bering Sea to southern extremity of California. *Proc. U. S. N. M.*, XVI, 1893, No. 927, p. 76, figs. 1-4 of Pl. IV.
- Chromoteleia semicyanea*. Ashmead. (Hym.) St. Vincent, West Indies. *Bull. U. S. N. M.*, No. 45, 1893, p. 220, fig. 3 of Pl. IX.
- Cinetus californicus*.* Ashmead. (Hym.) Santa Cruz Mountains, California. *Bull. U. S. N. M.*, No. 45, 1893, p. 361.
- Cinetus macrodyctium*.* Ashmead. (Hym.) Arlington, Va., and Westcliffe, Colo. *Bull. U. S. N. M.*, No. 45, 1893, p. 360.
- Cinetus ruficornis*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 360.
- Cinetus similis*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 361.
- Cladophlebis heterophylla*. Fontaine. (Foss. Pl.) Kootanie group, Great Falls, Mont. *Proc. U. S. N. M.*, XV, 1892, p. 493, No. 918, fig. 2 of Pl. LXXXIV.
- Cœlocerus grandis*. M. J. Rathbun. (Decap.) Gulf of Mexico. *Proc. U. S. N. M.*, XVI, 1893, No. 927, p. 79, Pl. V.
- Cœlopelta mirabilis*. Ashmead. (Hym.) St. Vincent, West Indies. *Bull. U. S. N. M.*, No. 45, 1893, p. 290, fig. 6 of Pl. XII.

- Collodes tenuirostris*. M. J. Rathbun. (Decap.) Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 230.
- Columba Taczanowskii*. Stejneger. (Aves.) Korea, Ussuri, and probably northern China. *Proc. U. S. N. M.*, XVI, 1893, No. 957, p. 624.
- Conus okhotensis*. Dall. (Moll.) Arctic Siberia. *Proc. U. S. N. M.*, XVI, 1893, No. 946, p. 475, fig. 4 of Pl. LVI.
- Couesius Greeni*. Jordan. (Pisc.) Stuart's Lake, British Columbia. *Proc. U. S. N. M.*, XVI, 1893, No. 938, p. 313.
- Cradactis digitata*. McMurrich. (Actin.) Off Rio de la Plata, Argentine Republic. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 198, figs. 109-112 of Pl. XXXIII.
- Cremastobæus bicolor*. Ashmead. (Hym.) St. Vincent, West Indies. *Bull. U. S. N. M.*, No. 45, 1893, p. 229, fig. 3 of Pl. X.
- Cryptophrys concharum*. M. J. Rathbun. (Decap.) False Bay, San Diego County, Cal., and Puget Sound. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 250.
- Ctenoiulus Chatelainei*. Cook. (Myr.) St. Paul de Loanda, Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 968, p. 705.
- Cycloxanthus californiensis*. M. J. Rathbun. (Decap.) Catalina Harbor and San Diego, Cal., and Guadalupe Island, Lower California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 237.
- Cyrela brunnea*. Marx. (Arach.) Kongo, Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 951, p. 588, figs. 2a-2d of Pl. LXX.
- Cyrela maculata*. Marx. (Arach.) Kilima-Njaro, Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 951, p. 588, figs. 3a and 3b of Pl. LXX.
- Cymbactis faeculenta*. McMurrich. (Actin.) North of San Clemente Island, California. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 174, figs. 69-71 of Pl. XXVIII.
- Cymopolia fragilis*. M. J. Rathbun. (Decap.) Off Lower California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 259.
- Cymopolia zonata*. M. J. Rathbun. (Decap.) Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 259.
- Cyrtomaia Smithi*. M. J. Rathbun. (Decap.) Off Sandwich Islands. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 228.
- Deckenia cristata*. M. J. Rathbun. (Decap.) Seychelles. *Proc. U. S. N. M.*, XVII, 1894, No. 979, p. 23.
- Diapria californica*. Ashmead. (Hym.) Santa Cruz Mountains, California. *Bull. U. S. N. M.*, No. 45, 1893, p. 422, fig. 3 of Pl. XVIII.
- Diapria columbiana*.* Ashmead. (Hym.) District of Columbia and Virginia. *Bull. U. S. N. M.*, No. 45, 1893, p. 424.
- Diapria erythropus*.* Ashmead. (Hym.) District of Columbia, Virginia, and Florida. *Bull. U. S. N. M.*, No. 45, 1893, p. 423.
- Diapria muscæ*. Ashmead. (Hym.) Sacramento County, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 426.
- Diapria tetraplasta*.* Ashmead. (Hym.) Carolina and Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 426.
- Diapria texana*.* Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 424.
- Diapria utahensis*.* Ashmead. (Hym.) Salt Lake, Utah. *Bull. U. S. N. M.*, No. 45, 1893, p. 423.
- Diapria virginica*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 426.
- Diloma* (Chlorodiloma) *runderata*. Dall. (Moll.) Arctic Siberia. *Proc. U. S. N. M.*, XVI, 1893, No. 946, p. 476, fig. 3 of Pl. LVI.
- Dionites buchianus*, var. *rariueris*. Fontaine. (Foss. Pl.) Near Glen Rose, Tex. *Proc. U. S. N. M.*, XVI, 1893, No. 934, p. 264, figs. 3, 4 of Pl. XXXVI.
- Diplax dilatata*. Calvert. (Neur.) St. Helena. *Proc. U. S. N. M.*, XVI, 1893, No. 951, p. 582, figs. 1, 2.
- Diplodactylus inexpectatus*. Stejneger. (Rept.) Ile Mahé, Seychelles. *Proc. U. S. N. M.*, XVI, 1893, No. 970, p. 714.
- Dissolcus nigricornis*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 165, fig. 8 of Pl. VII.
- Dissomphalus californicus*.* Ashmead. (Hym.) California. *Bull. U. S. N. M.*, No. 45, 1893, p. 43.
- Dissomphalus carolinensis*.* Ashmead. (Hym.) North Carolina. *Bull. U. S. N. M.*, No. 45, 1893, p. 43.
- Dissomphalus xanthopus*.* Ashmead. (Hym.) Arlington, Va., and Cedar Point, Md. *Bull. U. S. N. M.*, No. 45, 1893, p. 42, figs. 7 and 8 of Pl. II.
- Ebalia americana*. M. J. Rathbun. (Decap.) Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 254.

- Edwardsia intermedia*. McMurrich. (Actin.) West coast of Patagonia. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 136, figs. 1-4 of Pl. XIX.
- Eliomys parvus*. True. (Mamm.) Tana River, East Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 954, p. 601.
- Emberiza ciopsis Ijima*. Stejneger. (Aves.) Tsushima, Japan. *Proc. U. S. N. M.*, XVI, 1893, No. 957, p. 637.
- Epeira eclipsis*. Marx. (Arach.) Kongo, Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 951, p. 590, figs. 6a and 6b of Pl. LXX.
- Epilobocera granulata*. M. J. Rathbun. (Decap.) West Indies. *Proc. U. S. N. M.*, XVI, 1893, No. 959, p. 659, fig. 6 of Pl. LXXVII.
- Epilobocera haytensis*. M. J. Rathbun. (Decap.) Hayti and San Domingo. *Proc. U. S. N. M.*, XVI, 1893, No. 959, p. 658, figs. 4 and 5 of Pl. LXXVII.
- Epyris aneiceps*. Ashmead. (Hym.) Fort Capron, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 59.
- Epyris carbonarius*. Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 59, fig. 4 of Pl. IV.
- Epyris columbianus*. Ashmead. (Hym.) Washington, D. C., and Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 61.
- Epyris megacephalus*. Ashmead. (Hym.) California. *Bull. U. S. N. M.*, No. 45, 1893, p. 61.
- Epyris occidentalis*. Ashmead. (Hym.) California. *Bull. U. S. N. M.*, No. 45, 1893, p. 59.
- Equisetum texense*. Fontaine. (Foss. Pl.) Near Glen Rose, Tex. *Proc. U. S. N. M.*, XVI, 1893, No. 934, p. 263, fig. 1 of Pl. XXXVI.
- Eremias Hoehneli*. Stejneger. (Rept.) Tana River, East Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 970, p. 719.
- Eremias sexteniata*. Stejneger. (Rept.) Tana River, East Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 970, p. 718.
- Ericerus latinanus*. M. J. Rathbun. (Decap.) Gulf of California, at Concepcion Bay, Lower California, and off Adair Bay, Mexico. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 224.
- Ereileptus spinosus*. M. J. Rathbun. (Decap.) Off San Diego, Cal. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 227.
- Erimetopus spinosus*. M. J. Rathbun. (Decap.) Kongo, West Central Africa. *Proc. U. S. N. M.*, XVII, 1894, No. 980, p. 26.
- Eritrissomerus cecidomyiæ*. Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 299, fig. 1 of Pl. XIII.
- Ethusa lata*. M. J. Rathbun. (Decap.) Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 258.
- Eumegaspilus erythrothorax*. Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 120, fig. 6 of Pl. VI.
- Euprognatha bifida*. M. J. Rathbun. (Decap.) Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 231.
- Foudia aldabrana*. Ridgway. (Aves.) Aldabra Island. *Proc. U. S. N. M.*, XVI, 1893, No. 953, p. 5' 8.
- Frenelopsis varians*. Fontaine. (Foss. Pl.) Near Glen Rose, Tex. *Proc. U. S. N. M.*, XVI, 1893, No. 934, p. 273, figs. 1 and 2 of Pl. XL and figs. 1-3a of Pl. XLI.
- Galesus atricornis*. Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 409.
- Galesus pilosus*. Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 411.
- Galesus texanus*. Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 411.
- Gelasimus coloradensis*. M. J. Rathbun. (Decap.) Colorado River, Lower California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 246.
- Gelasimus gracilis*. M. J. Rathbun. (Decap.) San Diego, Cal.; Todos Santos Bay, La Paz, and San Luis Gonzales Bay, Lower California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 244.
- Gelasimus latimanus*. M. J. Rathbun. (Decap.) La Paz, Lower California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 245.
- Geothlypis poliocephala* Ralphi. Ridgway. (Aves.) Lower Rio Grande Valley. *Proc. U. S. N. M.*, XVI, 1893, No. 964, p. 692.
- Glyptonota nigriclavata*. Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 401, fig. 1 of Pl. XVII.

- Gonatopus bicolor*. Ashmead. (Hym.) Selma, Ala. *Bull. U. S. N. M.*, No. 45, 1893, p. 85.
- Gonatopus californicus*. Ashmead. (Hym.) California. *Bull. U. S. N. M.*, No. 45, 1893, p. 85.
- Gonatopus flavifrons*. * Ashmead. (Hym.) Albany, N. Y. *Bull. U. S. N. M.*, No. 45, 1893, p. 84, fig. 4 of Pl. V.
- Goniozus columbianus*. * Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 76.
- Goniozus megacephalus*. Ashmead. (Hym.) Key West, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 74.
- Goniozus platynotæ*. Ashmead. (Hym.) Virginia, Maryland, District of Columbia, and Florida. *Bull. U. S. N. M.*, No. 45, 1893, p. 75, fig. 8 of Pl. IV.
- Goniozus politus*. * Ashmead. (Hym.) Virginia Beach, Md. *Bull. U. S. N. M.*, No. 45, 1893, p. 75.
- Gryon columbianus*. * Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 208.
- Gryon flavipes*. * Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 208.
- Gryon fumipennis*. * Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 206.
- Hadronotus largi*. Ashmead. (Hym.) Los Angeles, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 231.
- Hadronotus myrmecophilus*. * Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 232.
- Hadronotus rugiceps*. * Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 233.
- Halcurias pilatus*. McMurrich. (Actin.) Between Wellington Island and Patagonia. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 142, figs. 12 and 13 of Pl. XX and 14 and 15 of Pl. XXI.
- Hemilexis californica*. * Ashmead. (Hym.) Santa Cruz Mountains, California. *Bull. U. S. N. M.*, No. 45, 1893, p. 390.
- Hemilexis submarginata*. * Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 389, fig. 4 of Pl. XVI.
- Hemilexodes floridana*. * Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 400, fig. 8 of Pl. XVI.
- Hoplogryon claripennis*. * Ashmead. (Hym.) Virginia. *Bull. U. S. N. M.*, No. 45, 1893, p. 203.
- Hoplogryon longipennis*. * Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 202, fig. 6 of Pl. VIII.
- Hoplogryon obscuripes*. * Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 204.
- Hoplogryon pteridis*. * Ashmead. (Hym.) Fortress Monroe, Va., and District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 203.
- Hoplogryon rufipes*. * Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 205.
- Hoplogryon solitarius*. * Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 205.
- Hoplogryon tibialis*. * Ashmead. (Hym.) Virginia. *Bull. U. S. N. M.*, No. 45, 1893, p. 203.
- Hoplopria pulchripennis*. * Ashmead. (Hym.) Bogota. *Bull. U. S. N. M.*, No. 45, 1893, p. 388.
- Hyastenus caribbæus*. M. J. Rathbun. (Decap.) Sabanilla, Colombia. *Proc. U. S. N. M.*, XVI, 1893, No. 927, p. 85, fig. 2 of Pl. VI.
- Hypocælus Abbotti*. M. J. Rathbun. (Decap.) Aldabra Island. *Proc. U. S. N. M.*, XVII, 1894, No. 979, p. 21.
- Hypogeophis alternans*. Stejneger. (Batr.) Seychelle Islands. *Proc. U. S. N. M.*, XVI, 1893, No. 970, p. 739.
- Ibis Abbotti*. Ridgway. (Aves.) Aldabra Island. *Proc. U. S. N. M.*, XVI, 1893, No. 953, p. 599.
- Idris læviceps*. * Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 235.
- Inachoides magdalenensis*. M. J. Rathbun. (Decap.) Off Lower California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 228.
- Inostemma californica*. Ashmead. (Hym.) Los Angeles, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 259.
- Inostemma Lintneri*. * Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 259.
- Isobrachium magnum*. * Ashmead. (Hym.) Spokane Falls, Wash. *Bull. U. S. N. M.*, No. 45, 1893, p. 36.

- Isobranchium mandibulare*.* Ashmead. (Hym.) District of Columbia and Fort George, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 38.
- Isobranchium montanum*.* Ashmead. (Hym.) Montana and Arizona. *Bull. U. S. N. M.*, No. 45, 1893, p. 39.
- Isobranchium myrmecophilum*.* Ashmead. (Hym.) Pennsylvania, District of Columbia, Montana, and Arizona. *Bull. U. S. N. M.*, No. 45, 1893, p. 37, figs. 3 and 4 of Pl. II.
- Isobranchium rufiventre*. Ashmead. (Hym.) Yuma, Ariz., Montana, Texas, and Virginia. *Bull. U. S. N. M.*, No. 45, 1893, p. 38.
- Isorhombus arizonensis*. Ashmead. (Hym.) Fort Huachuca, Ariz. *Bull. U. S. N. M.*, No. 45, 1893, p. 277.
- Istosiasius fuscipennis*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 255.
- Ixocncla madagascariensis rostrata*. Ridgway. (Aves.) Aldabra and Gloriosa islands. *Proc. U. S. N. M.*, XVI, 1893, No. 953, p. 597.
- Labeo longitarsis*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 88.
- Labeo texanus*.* Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 89.
- Labeo typhlocybae*. Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 89, fig. 5 of Pl. V.
- Laelius nigripilosus*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 52, fig. 7 of Pl. III.
- Laelius rufipes*. Ashmead. (Hym.) Western States. *Bull. U. S. N. M.*, No. 45, 1893, p. 51.
- Laelius tricarinatus*.* Ashmead. (Hym.) District of Columbia and Florida. *Bull. U. S. N. M.*, No. 45, 1893, p. 51.
- Laelius trogodermais*. Ashmead. (Hym.) District of Columbia (?). *Bull. U. S. N. M.*, No. 45, 1893, p. 51.
- Lagynodes minutus*. Ashmead. (Hym.) Washington, D. C., and Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 121.
- Lambrus (Parthenolambrus) exilipes*. M. J. Rathbun. (Decap.) Off San Domingo Point, Lower California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 234.
- Lapitha spinosa*. Ashmead. (Hym.) St. Vincent, West Indies. *Bull. U. S. N. M.*, No. 45, 1893, p. 222, fig. 8 of Pl. IX.
- Leiothealia badia*. McMurrich. (Actin.) Straits of Magellan. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 194, fig. 104 of Pl. XXXII and fig. 106 of Pl. XXXIII.
- Leptacis breviventris*.* Ashmead. (Hym.) District of Columbia, Virginia, and Maryland. *Bull. U. S. N. M.*, No. 45, 1893, p. 273.
- Leptacis flavicornis*.* Ashmead. (Hym.) Washington, D. C., and Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 275.
- Leptacis floridanus*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 272.
- Leptacis longiventris*. Ashmead. (Hym.) District of Columbia and Virginia. *Bull. U. S. N. M.*, No. 45, 1893, p. 273.
- Leptacis pubescens*.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 275.
- Leptacis punctatus*.* Ashmead. (Hym.) Florida, District of Columbia, and Virginia. *Bull. U. S. N. M.*, No. 45, 1893, p. 272.
- Leptacis puncticeps*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 275.
- Leptacis rugiceps*.* Ashmead. (Hym.) Jacksonville, Fla., and Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 272, fig. 1 of Pl. XII.
- Leptacis striatifrons*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 273.
- Leptecees ornatus*. M. J. Rathbun. (Decap.) Off Arrowsmith Bank, Yucatan. *Proc. U. S. N. M.*, XVI, 1893, No. 927, p. 84, fig. 1 of Pl. VI.
- Leptodesmus borealis*.* Bollman. (Myr.) Winona, Minn. *Bull. U. S. N. M.*, No. 46, 1893, p. 183.
- Leptorhaptus conicus*.* Ashmead. (Hym.) Arlington, Va., and Cedar Point, Md. *Bull. U. S. N. M.*, No. 45, 1893, p. 350, fig. 1 of Pl. XVI.
- Leptorhaptus rufus*.* Ashmead. (Hym.) Jacksonville, Fla., and Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 350.
- Libellula (Orthetrum) capensis*. Culvert. (Pseud.) Cape Town, Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 951, p. 584, fig. 3.

- Lithobius Stejnegeri*. Bollman. (Myr.) Bering Island, Topor Rof Island, and Gavaus Kaya Topka, Copper Island. *Bull. U. S. N. M.*, No. 46, 1893, p. 199.
- Locustella hondoensis** Stejneger. (Aves.) Province of Shimoso, Japan. *Proc. U. S. N. M.*, XVI, 1893, No. 957, p. 633.
- Lophozoymus (Lophoxanthus) frontalis*. M. J. Rathbun. (Decap.) Off San Diego, Cal. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 236.
- Loxotropa californica** Ashmead. (Hym.) Santa Cruz Mountains, California. *Bull. U. S. N. M.*, No. 45, 1893, p. 415.
- Loxotropa columbiana** Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 413.
- Loxotropa flavipes** Ashmead. (Hym.) Maryland, Virginia, and District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 415.
- Loxotropa nana** Ashmead. (Hym.) Jacksonville and Fort George Island, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 415.
- Loxotropa ruficornis** Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 414, fig. 8 of Pl. XVII.
- Lycosa brevipes*. Banks. (Arach.) Kongo, Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 951, p. 587, fig. 12.
- Lycocerus californicus*. Ashmead. (Hym.) Los Angeles, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 111.
- Lycocerus 6-dentatus*. Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 111, fig. 8 of Pl. VI.
- Lycocerus pacificus*. Ashmead. (Hym.) Placer County, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 112.
- Lycocerus picipes** Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 109.
- Mabuya Chanleri*. Stejneger. (Rept.) Taná River, East Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 970, p. 721.
- Macacus rhesus villosus*. True. (Mamm.) Vale of Kashmir. *Proc. U. S. N. M.*, XVII, 1894, No. 976, p. 2.
- Machomenus albidus*. Marx. (Arach.) Kongo, Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 951, p. 589, figs. 4a-4c of Pl. LXX.
- Macroteleia macrogaster** Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 217, fig. 6 of Pl. IX.
- Macroteleia virginicensis** Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 218.
- Megaspilus ambiguus** Ashmead. (Hym.) Arlington, Va., and Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 115.
- Megaspilus anomaliventris** Ashmead. (Hym.) Marquette, Mich. *Bull. U. S. N. M.*, No. 45, 1893, p. 114.
- Megaspilus californicus** Ashmead. (Hym.) California. *Bull. U. S. N. M.*, No. 45, 1893, p. 118.
- Megaspilus laeviceps** Ashmead. (Hym.) Arlington, Va., Washington, D. C., and Bladensburg, Md. *Bull. U. S. N. M.*, No. 45, 1893, p. 118.
- Megaspilus marylandicus** Ashmead. (Hym.) Oakland, Md. *Bull. U. S. N. M.*, No. 45, 1893, p. 116.
- Megaspilus Pergandei** Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 118.
- Megaspilus Popenoei** Ashmead. (Hym.) Manhattan, Kans. *Bull. U. S. N. M.*, No. 45, 1893, p. 114.
- Megaspilus Schwarzii** Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 115.
- Megaspilus striatipes** Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 115, fig. 7 of Pl. VI.
- Megaspilus virginicus** Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 117.
- Menippe convexa*. M. J. Rathbun. (Decap.) Honolulu. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 239.
- Mesitius bifoveolatus*. Ashmead. (Hym.) Georgia, Florida, and Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 66.
- Mesitius brachypterus** Ashmead. (Hym.) Carolina. *Bull. U. S. N. M.*, No. 45, 1893, p. 66.
- Mesitius californicus*. Ashmead. (Hym.) California. *Bull. U. S. N. M.*, No. 45, 1893, p. 65.
- Mesitius minutus** Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 65.
- Mesitius nevadensis** Ashmead. (Hym.) Nevada. *Bull. U. S. N. M.*, No. 45, 1893, p. 64.

- Mesitius texanus*.* Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 67.
- Mesitius vancouverensis*.* Ashmead. (Hym.) Vancouver Island. *Bull. U. S. N. M.*, No. 45, 1893, p. 64, fig. 5 of Pl. IV.
- Mesorhœa Gilli*. M. J. Rathbun. (Decap.) Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 235.
- Micropanope polita*. M. J. Rathbun. (Decap.) Off Magdalena Bay, Lower California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 238.
- Mictomys innuitus*. True. (Mamm.) Fort Chimo, Ungava, Labrador. *Proc. U. S. N. M.*, XVII, 1894, No. 999, p. 243.
- Miota analis*.* Ashmead. (Hym.) Carolina. *Bull. U. S. N. M.*, No. 45, 1893, p. 352.
- Monocrita carinata*.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 254, fig. 4 of Pl. XI.
- Mursia hawaiiensis*. M. J. Rathbun. (Decap.) Off Sandwich Islands. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 252.
- Mus arianus griseus*. True. (Mamm.) Central Kashmir and Pir Panjal Pass. *Proc. U. S. N. M.*, XVII, 1894, No. 976, p. 8.
- Mustana*. True. (Mamm.) Tana River, East Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 554, p. 602.
- Myodes nigripes*. True. (Mamm.) St. George's Island, Alaska. *Proc. U. S. N. M.*, XVII, 1894, No. 999, p. 242.
- Myonanthus ambiguus*. McMurrich. (Actin.) North of San Clemente Island, California. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 151, fig. 22 of Pl. XXI and fig. 23 of Pl. XXII.
- Myra subovata*. M. J. Rathbun. (Decap.) Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 256.
- Myra Townsendi*. M. J. Rathbun. (Decap.) Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 255.
- Neorhynchus mexicanus*. M. J. Rathbun. (Decap.) Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 233.
- Neotoma macrotis simplex*. True. (Mamm.) Fort Tejon, Cal. *Proc. U. S. N. M.*, XVII, 1894, No. 1006, p. 351.
- Neotoma occidentalis fusca*. True. (Mamm.) Fort Umpqua, Oreg. *Proc. U. S. N. M.*, XVII, 1894, No. 1006, p. 354.
- Neotoma splendens*. True. (Mamm.) Marin County, Cal. *Proc. U. S. N. M.*, XVII, 1894, No. 1006, p. 353.
- Neotoma venusta*. True. (Mamm.) Carizzo Creek, California. *Proc. U. S. N. M.*, XVII, 1894, No. 1006, p. 354.
- Neptunus (Hellenus) iridescens*. M. J. Rathbun. (Decap.) Gulf of California and west coast of Lower California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 240.
- Nursia tuberculata*. M. J. Rathbun. (Decap.) Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 257.
- Oceanodroma Townsendi*. Ridgway. (Aves.) Off the coast of western Mexico. *Proc. U. S. N. M.*, XVI, 1893, No. 962, p. 687.
- Odontophorus consobrinus*. Ridgway. (Aves.) Mirador, Vera Cruz, Mexico. *Proc. U. S. N. M.*, XVI, 1893, No. 945, p. 469.
- Œdiplax granulatus*. M. J. Rathbun. (Decap.) Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 242.
- Opisthacantha mellipes*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 221, fig. 4 of Pl. IX.
- Opisthopus transversus*. M. J. Rathbun. (Decap.) Monterey and Point Loma, Cal. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 252.
- Oractis diomedea*. McMurrich. (Actin.) North of San Clemente Island, California. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 138, figs. 5-8 of Pl. XIX and 9-11 of Pl. XX.
- Oulactis californica*. McMurrich. (Actin.) Pichilingue Bay, Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 196, fig. 105 of Pl. XXXII and figs. 107, 108 of Pl. XXXIII.
- Pachygrapsus longipes*. M. J. Rathbun. (Decap.) Honolulu. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 247.
- Pagiophyllum dubium*. Fontaine. (Foss. Pl.) Near Glen Rose, Tex. *Proc. U. S. N. M.*, XVI, 1893, No. 934, p. 271, figs. 2-11 of Pl. XXXIX.
- Pantoclis analis*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 370, fig. 2 of Pl. XV.

- Pantoclis californica*.* Ashmead. (Hym.) Santa Cruz Mountains, California. *Bull. U. S. N. M.*, No. 45, 1893, p. 371, fig. 2a of Pl. XV.
- Pantoclis crassicornis*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 369.
- Pantoclis flavipes*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 370.
- Pantoclis floridana*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 372.
- Pantoclis insularis*.* Ashmead. (Hym.) Fort George Island, Georgia. *Bull. U. S. N. M.*, No. 45, 1893, p. 369.
- Pantoclis megaplasta*.* Ashmead. (Hym.) Manhattan, Kans. *Bull. U. S. N. M.*, No. 45, 1893, p. 368.
- Pantoclis montana*.* Ashmead. (Hym.) Colorado, and Santa Cruz Mountains, California. *Bull. U. S. N. M.*, No. 45, 1893, p. 368.
- Pantoclis picipes*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 368.
- Pantoclis rufescens*.* Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 272.
- Pantoclis ruficauda*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 370.
- Pantolyta brunnea*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 383, fig. 1 of Pl. XVI.
- Paractis vinosa*. McMurrich. (Actin.) North of San Clemente Island, California. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 163, figs. 37-40 of Pl. XXIII and fig. 41 of Pl. XXIV.
- Paramesius oregonensis*.* Ashmead. (Hym.) Portland, Oreg. *Bull. U. S. N. M.*, No. 45, 1893, p. 395.
- Paramesius pallidipes*.* Ashmead. (Hym.) Carolina and District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 395, fig. 5 of Pl. XV.
- Paramesius parvulus*.* Ashmead. (Hym.) District of Columbia and Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 393.
- Paramesius spinosus*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 394.
- Paramesius utahensis*.* Ashmead. (Hym.) Utah Lake, Utah. *Bull. U. S. N. M.*, No. 45, 1893, p. 394.
- Parathelphusa Campi*. M. J. Rathbun. (Decap.) Kongo, West Central Africa. *Proc. U. S. N. M.*, XVII, 1894, No. 980, p. 25.
- Pardosa valida*. Banks. (Arach.) Kongo and Sierra Leone, Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 951, p. 587, fig. 13.
- Peachia Koreni*. McMurrich. (Actia.) Off Rio de la Plata, Argentine Republic. *Proc. U. S. N. M.*, XVI, 1893, No. 930 p. 144, fig. 16 of Pl. XXI.
- Pecopteris montanensis*. Fontaine. (Foss. Pl.) Kootanie Group, Great Falls, Mont. *Proc. U. S. N. M.*, XV, 1892, No. 918, p. 492, figs. 1, 1a of Pl. LXXXIII.
- Perisemus minimus*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 71.
- Perisemus oregonensis*.* Ashmead. (Hym.) Portland, Oreg. *Bull. U. S. N. M.*, No. 45, 1893, p. 70.
- Phænopria affinis*.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 440.
- Phænopria aptera*.* Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 439.
- Phænopria hæmatobæ*. Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 438.
- Phænopria minutissima*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 438.
- Phænopria montana*.* Ashmead. (Hym.) Santa Cruz Mountains, California. *Bull. U. S. N. M.*, No. 45, 1893, p. 440.
- Phænopria parva*.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 440.
- Phænopria Schwarzii*. Ashmead. (Hym.) Jacksonville, Fla., District of Columbia, Maryland, and Virginia. *Bull. U. S. N. M.*, No. 45, 1893, p. 439.
- Phænopria virginica*.* Ashmead. (Hym.) District of Columbia and Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 438, fig. 5 of Pl. XVIII. †
- Phanurus flavipes*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 141.
- Phanurus floridanus*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 140, fig. 5 of Pl. VII.

- Phanurus ovivorus*. Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 140.
- Phelsuma Abbotti*. Stejneger. (Rept.) Aldabra Island. *Proc. U. S. N. M.*, XVI, 1893, No. 970, p. 716.
- Phorbas laticeps*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 90, fig. 7 of Pl. V.
- Pilodius flavus*. M. J. Rathbun. (Decap.) Off Sandwich Islands. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 239.
- Pilumnus diomedææ*. M. J. Rathbun. (Decap.) Off Havana, Cuba, and Yucatan. *Proc. U. S. N. M.*, XVII, 1894, No. 986, p. 85.
- Pilumnus gonзалensis*. M. J. Rathbun. (Decap.) San Luis, Gonzales Bay. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 240.
- Pinnixa californiensis*. M. J. Rathbun. (Decap.) Monterey Bay, and off Point Ano Nuevo, California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 249.
- Pinnixa occidentalis*. M. J. Rathbun. (Decap.) From Iliuliuk Harbor, Unalaska, to Gray's Harbor, Washington; Alaska, and San Diego, Cal. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 248.
- Plagiogrammus Hopkinsii*. T. H. Bean. (Pisc.) Monterey, Cal. *Proc. U. S. N. M.*, XVI, 1893, No. 967, p. 700.
- Platygaster aciculatus*.* Ashmead. (Hym.) Pennsylvania. *Bull. U. S. N. M.*, No. 45, 1893, p. 326.
- Platygaster aphidis*. Ashmead. (Hym.) Richfield Springs, N. Y. *Bull. U. S. N. M.*, No. 45, 1893, p. 325.
- Platygaster caryæ*. Ashmead. (Hym.) Jacksonville, Fla., District of Columbia, and St. Louis. *Bull. U. S. N. M.*, No. 45, 1893, p. 325.
- Platygaster obscuripennis*.* Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 325.
- Platymera californiensis*. M. J. Rathbun. (Decap.) Off the coast of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 253.
- Podochela (Coryrhynchus) lobifrons*. M. J. Rathbun. (Decap.) Abreojos Point, Lower California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 226.
- Podochela (Coryrhynchus) mexicana*. M. J. Rathbun. (Decap.) Off Adair Bay, Mexico. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 225.
- Podochela tenuipes*. M. J. Rathbun. (Decap.) Southern California and Lower California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 225.
- Polygnotus actinomeridis*. Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 317.
- Polygnotus alnicola*. Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 310.
- Polygnotus angulatus*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 319.
- Polygnotus artemisiæ*. Ashmead. (Hym.) Lancaster, Los Angeles County, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 309.
- Polygnotus astericola*. Ashmead. (Hym.) Holderness, N. H. *Bull. U. S. N. M.*, No. 45, 1893, p. 320.
- Polygnotus asynaptæ*. Ashmead. (Hym.) Maywood, Ill. *Bull. U. S. N. M.*, No. 45, 1893, p. 315.
- Polygnotus atriplicis*. Ashmead. (Hym.) Los Angeles and San Bernardino Counties, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 308.
- Polygnotus californicus*. Ashmead. (Hym.) San Francisco and Alameda, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 321.
- Polygnotus coloradensis*. Ashmead. (Hym.) Fort Garland, Colo. *Bull. U. S. N. M.*, No. 45, 1893, p. 320.
- Polygnotus cynipicola*. Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 314.
- Polygnotus diplosidis*. Ashmead. (Hym.) New Brunswick, N. J. *Bull. U. S. N. M.*, No. 45, 1893, p. 306.
- Polygnotus eurotiæ*. Ashmead. (Hym.) San Bernardino County, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 315.
- Polygnotus euuræ*. Ashmead. (Hym.) St. Louis, Mo. *Bull. U. S. N. M.*, No. 45, 1893, p. 318.
- Polygnotus filicornis*.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 231.
- Polygnotus floridanus*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 318.
- Polygnotus huachuæ*. Ashmead. (Hym.) Fort Huachuca, Ariz. *Bull. U. S. N. M.*, No. 45, 1893, p. 316.

- Polygnotus lævicollis*.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 320.
- Polygnotus laticeps*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 311.
- Polygnotus pinicola*. Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 307.
- Polygnotus proximus*. Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 312.
- Polygnotus rubi*. Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 315.
- Polygnotus salicicola*. Ashmead. (Hym.) Los Angeles, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 305.
- Polygnotus striaticeps*. Ashmead. (Hym.) San Diego and Los Angeles Counties, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 308.
- Polygnotus striaticollis*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 319.
- Polygnotus tumidus*. Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 310.
- Polygnotus utahensis*. Ashmead. (Hym.) Pariah, Utah. *Bull. U. S. N. M.*, No. 45, 1893, p. 314.
- Polygnotus vernoniæ*. Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 317.
- Polygnotus virginienis*.* Ashmead. (Hym.) District of Columbia and Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 309.
- Polygnotus viticola*. Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 313.
- Polymecus alnicola*. Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 283.
- Polymecus auripes*.* Ashmead. (Hym.) Virginia. *Bull. U. S. N. M.*, No. 45, 1893, p. 283.
- Polymecus compressiventris*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 282.
- Polymecus lupinicola*. Ashmead. (Hym.) San Francisco, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 281.
- Polymecus melliscapus*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 282.
- Polymecus picipes*.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 282.
- Polymecus vancouverensis*.* Ashmead. (Hym.) Vancouver Island. *Bull. U. S. N. M.*, No. 45, 1893, p. 281.
- Polypeza Pergandei*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 387, fig. 2 of Pl. XVI.
- Populus Meedsii*. Knowlton. (Foss Pl.) Fort Union Group of Montana. *Proc. U. S. N. M.*, XVII, 1893, No. 921, p. 34, figs. 1 and 2 of Pl. I.
- Potamocarcinus nicaraguensis*. M. J. Rathbun. (Decap.) Nicaragua and Costa Rica. *Proc. U. S. N. M.*, XVI, 1893, No. 959, p. 656, Pl. LXXVI and figs. 1-3 of Pl. LXXVII.
- Proctotrypes Belfragei*. Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 340.
- Proctotrypes canadensis*.* Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 342.
- Proctotrypes caroliensis*. Ashmead. (Hym.) North Carolina. *Bull. U. S. N. M.*, No. 45, 1893, p. 341.
- Proctotrypes clypeatus*.* Ashmead. (Hym.) Ithaca, N. Y. *Bull. U. S. N. M.*, No. 45, 1893, p. 339.
- Proctotrypes femoratus*.* Ashmead. (Hym.) Wyoming. *Bull. U. S. N. M.*, No. 45, 1893, p. 344.
- Proctotrypes Linellii*.* Ashmead. (Hym.) Long Island, New York. *Bull. U. S. N. M.*, No. 45, 1893, p. 337.
- Proctotrypes longiceps*.* Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 342.
- Proctotrypes medius*.* Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 343.
- Proctotrypes obliquus*. Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 338.
- Proctotrypes quadriceps*.* Ashmead. (Hym.) New Jersey. *Bull. U. S. N. M.*, No. 45, 1893, p. 343.
- Proctotrypes simulans*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 342.
- Proctotrypes terminalis*. Ashmead. (Hym.) Washington, D. C., and Colmbus, Ohio. *Bull. U. S. N. M.*, No. 45, 1893, p. 337.

- Proctotrypes texanus*.* Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 341.
- Prosacantha annulicornis*. Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 188.
- Prosacantha bilineata*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 194.
- Prosacantha californica*.* Ashmead. (Hym.) Santa Cruz Mountains, California. *Bull. U. S. N. M.*, No. 45, 1893, p. 190.
- Prosacantha caraborum*. Riley. (Hym.) Washington, D. C., and Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 191, fig. 4 of Pl. VIII.
- Prosacantha columbiana*.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 194.
- Prosacantha erythropus*.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 195.
- Prosacantha flavicoxa*.* Ashmead. (Hym.) Virginia. *Bull. U. S. N. M.*, No. 45, 1893, p. 196.
- Prosacantha flavopetiolata*.* Ashmead. (Hym.) District of Columbia and Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 196.
- Prosacantha gracilicornis*.* Ashmead. (Hym.) Carolina. *Bull. U. S. N. M.*, No. 45, 1893, p. 193.
- Prosacantha levifrons*.* Ashmead. (Hym.) Washington, D. C., and Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 190.
- Prosacantha Linellii*.* Ashmead. (Hym.) Long Island, New York. *Bull. U. S. N. M.*, No. 45, 1893, p. 195.
- Prosacantha marylandica*.* Ashmead. (Hym.) Oakland, Md. *Bull. U. S. N. M.*, No. 45, 1893, p. 193.
- Prosacantha melanopus*.* Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 189.
- Prosacantha nana*.* Ashmead. (Hym.) Utah Lake, Utah. *Bull. U. S. N. M.*, No. 45, 1893, p. 191.
- Prosacantha nigripes*.* Ashmead. (Hym.) The Dalles and Portland, Oreg. *Bull. U. S. N. M.*, No. 45, 1893, p. 188.
- Prosacantha pennsylvanica*.* Ashmead. (Hym.) Pennsylvania. *Bull. U. S. N. M.*, No. 45, 1893, p. 189.
- Prosacantha pleuralis*.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 195.
- Prosacantha punctiventris*.* Ashmead. (Hym.) Fortress Monroe, Va., and District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 192.
- Prosacantha pusilla*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 192.
- Prosacantha Schwarzii*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 192.
- Prosacantha striatifrons*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 188.
- Prosacantha striativentris*.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 197.
- Prosacantha utahensis*.* Ashmead. (Hym.) Park City, Utah. *Bull. U. S. N. M.*, No. 45, 1893, p. 189.
- Prosacantha xanthognatha*. Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 197.
- Psaltriparus melanotis iulus*. Jouy. (Aves.) Western Mexico. *Proc. U. S. N. M.*, XVI, 1893, No. 975, p. 776.
- Pseudothelphusa colombianus*. M. J. Rathbun. (Decap.) River David, Chiriqui, Colombia. *Proc. U. S. N. M.*, XVI, 1893, No. 959, p. 653, fig. 10 of Pl. LXXIV and fig. 1 of Pl. LXXV.
- Pseudothelphusa Dugesii*. M. J. Rathbun. (Decap.) Mexico. *Proc. U. S. N. M.*, XVI, 1893, No. 959, p. 651, figs. 4 and 5 of Pl. LXXIV.
- Pseudothelphusa Jouyi*. M. J. Rathbun. (Decap.) Mexico. *Proc. U. S. N. M.*, XVI, 1893, No. 959, p. 649, Pl. LXXIII, and figs. 1-3 of Pl. LXXIV.
- Pseudothelphusa lamellifrons*. M. J. Rathbun. (Decap.) Isthmus of Tehuantepec, Mexico. *Proc. U. S. N. M.*, XVI, 1893, No. 959, p. 654, figs. 2-5 of Pl. LXXV.
- Pseudothelphusa Richmondi*. M. J. Rathbun. (Decap.) Near Bluefields, Nicaragua. *Proc. U. S. N. M.*, XVI, 1893, No. 959, p. 654, figs. 6-10 of Pl. LXXV.
- Pseudothelphusa terrestris*. M. J. Rathbun. (Decap.) Near Guadalajara, Mexico. *Proc. U. S. N. M.*, XVI, 1893, No. 959, p. 651, figs. 6 and 7 of Pl. LXXIV.

- Pseudothelphusa verticalis*. M. J. Rathbun. (Decap.) Tehuantepec, Mexico. *Proc. U. S. N. M.*, XVI, 1893, No. 959, p. 652, figs. 8, 9 of Pl. LXXIV.
- Pseudothelphusa xantusi*. M. J. Rathbun. (Decap.) Mexico (?). *Proc. U. S. N. M.*, XVI, 1893, No. 959, p. 652.
- Psilomma columbianum*. Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 379, fig. 5 of Pl. XV.
- Pteropus aldabrensis*. True. (Mamm.) Aldabra Island, Indian Ocean. *Proc. U. S. N. M.*, XVI, 1893, No. 948, p. 533.
- Pugettia Dalli*. M. J. Rathbun. (Decap.) Off Southern California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 232.
- Pycnanthus maliformis*. McMurrich. (Actin.) North of San Clemente Island, California. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 172, figs. 64-67 of Pl. XXVII and fig. 68 of Pl. XXVIII.
- Randallia distincta*. M. J. Rathbun. (Decap.) Off Sandwich Islands. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 257.
- Rougetius aldabranus*. Ridgway. (Aves.) Aldabra Island. *Proc. U. S. N. M.*, XVI, 1893, No. 953, p. 598.
- Sagartia lactea*. McMurrich. (Actin.) Between Wellington Island and Patagonia. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 176, figs. 72-75 of Pl. XXVIII and fig. 76 of Pl. XXIX.
- Sagartia paradoxa*. McMurrich. (Actin.) Off Rio de la Plata, Argentine Republic. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 180, figs. 79-81 of Pl. XXIX and fig. 84 of Pl. XXX.
- Sagartia sancti Matthæi*. McMurrich. (Actin.) Off Rio de la Plata, Argentine Republic. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 179, figs. 77, 78 of Pl. XIX.
- Salmo mykiss aqua-bonita*. Jordan. (Pisc.) Kern River, California. *Proc. U. S. N. M.*, XV, 1892, No. 916, p. 481.
- Scapanus dilatus*. True. (Mamm.) Oregon. *Proc. U. S. N. M.*, XVII, 1894, No. 999, p. 242.
- Scelio calopteni*. Riley. (Hym.) Boscawren, N. H. *Bull. U. S. N. M.*, No. 45, 1893, p. 246.
- Scelio floridanus*. Ashmead. (Hym.) Haw Creek and Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 247.
- Scelio Luggeri*. Riley. (Hym.) Otter Tail County, Minn. *Bull. U. S. N. M.*, No. 45, 1893, p. 246.
- Scelio œdipodæ*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 245.
- Scelio pallidicornis*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 244.
- Scelio pallidipes*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 244.
- Scelio rufiventris*.* Ashmead. (Hym.) Fort George, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 245.
- Sceliomorpha* (?) *bisulca*. Ashmead. (Hym.) Texas and Florida. *Bull. U. S. N. M.*, No. 45, 1893, p. 240.
- Sceliomorpha longicornis*.* Ashmead. (Hym.) Santarem. *Bull. U. S. N. M.*, No. 45, 1893, p. 240.
- Sciurus Aberti concolor*. True. (Mamm.) Colorado. *Proc. U. S. N. M.*, XVII, No. 999, 1894, p. 241.
- Scleroplax granulatus*. M. J. Rathbun. (Decap.) Ensenada, Lower California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 251.
- Scolopendra hirsutipes*. Bollman. (Myr.) West Indies. *Bull. U. S. N. M.* No. 46, 1893, p. 198.
- Scolopendra nicaraguensis*. Bollman. (Myr.) Nicaragua. *Bull. U. S. N. M.*, No. 46, 1893, p. 198.
- Scolopendrasanatillæ*. Bollman. (Myr.) Sanatilla or Swan Island, Caribbean Sea. *Bull. U. S. N. M.*, No. 46, 1893, p. 199.
- Scolopocryptops calcaratus*.* Bollman. (Myr.) Bloomington, Ind. *Bull. U. S. N. M.*, No. 46, 1893, p. 133.
- Scutigera flavipes*. Bollman. (Myr.) San Salvador, Bahamas. *Bull. U. S. N. M.*, No. 46, 1893, p. 200.
- Selenocosmia nigroventris*. Marx. (Arach.) Kongo, Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 951, p. 587, figs. 1a, 1b of Pl. LXX.
- Selenops Brownii*. Marx. (Arach.) Kongo, Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 951, p. 589, fig. 5a of Pl. LXX.
- Semele Stimpsoni*. Dall. (Moll.) Penjinsk Gulf, Arctic Siberia. *Proc. U. S. N. M.*, XVI, 1893, No. 946, p. 473, fig. 5 of Pl. LVI.

- Sequoia pagiophylloides*. Fontaine. (Foss. Pl.) Near Glen Rose, Tex. *Proc. U. S. N. M.*, XVI, 1893, No. 934, p. 276, figs. 1-3a of Pl. XLII.
- Sierola* (?) *ambigua*.* Ashmead. (Hym.) Brookings, S. Dak. *Bull. U. S. N. M.*, No. 45, 1893, p. 56, fig. 2 of Pl. IV.
- Simocephalus Chanleri*. Stejneger. (Rept.) Island of Manda, East Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 970, p. 726.
- Siphonaria penjinæ*. Dall. (Moll.) Arctic Siberia. *Proc. U. S. N. M.*, XVI, 1893, No. 946, p. 475, fig. 2 of Pl. LVI.
- Sitomys* (*Rhipidomys*) *decolorus*. True. (Mamm.) Honduras. *Proc. U. S. N. M.*, XVI, 1893, No. 963, p. 689.
- Solenolambrus decemspinus*. M. J. Rathbun. (Decap.) Gulf of Mexico. *Proc. U. S. N. M.*, XVII, 1894, No. 986, p. 84.
- Sparasion nigrum*.* Ashmead. (Hym.) Pen Mar, Pa., and Oakland, Md. *Bull. U. S. N. M.*, No. 45, 1893, p. 239.
- Sparasion pacificum*. Ashmead. (Hym.) California. *Bull. U. S. N. M.*, No. 45, 1893, p. 239.
- Sparasion pilosum*.* Ashmead. (Hym.) Nevada and Washington. *Bull. U. S. N. M.*, No. 45, 1893, p. 238, fig. 7 of Pl. X.
- Speocarcinus granulimanus*. M. J. Rathbun. (Decap.) Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 242.
- Sphenocarcinus Agassizi*. M. J. Rathbun. (Decap.) Gulf of California. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 231.
- Spilomicrus armatus*.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 397, fig. 7 of Pl. XVI.
- Spilomicrus atriclavus*.* Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 398.
- Spilomicrus flavicornis*. Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 398, fig. 7 of Pl. XVI.
- Spinus psaltria croceus*. Jouy. (Aves.) Western Central America. *Proc. U. S. N. M.*, XVI, 1893, No. 975, p. 780.
- Spirobolus bahamensis*. Bollman. (Myr.) San Salvador, Bahamas. *Bull. U. S. N. M.*, No. 46, 1893, p. 192.
- Spirobolus callipus*. Bollman. (Hym.) Guanajuato, Mexico. *Bull. U. S. N. M.*, No. 46, 1893, p. 191.
- Spirobolus Dugesi*. Bollman. (Myr.) Guanajuato, Mexico. *Bull. U. S. N. M.*, No. 46, 1893, p. 194.
- Spirobolus gracilis*. Bollman. (Myr.) Paramaribo, Surinam. *Bull. U. S. N. M.*, No. 46, 1893, p. 190.
- Spirobolus surinamensis*. Bollman. (Myr.) Paramaribo, Surinam. *Bull. U. S. N. M.*, No. 46, 1893, p. 192.
- Spirobolus zonipus*. Bollman. (Myr.) Paramaribo, Surinam. *Bull. U. S. N. M.*, No. 46, 1893, p. 194.
- Stephanaetis hyalonematis*. McMurrich. (Actin.) Off Galapagos Islands. *Proc. U. S. N. M.*, XVI, 1893, No. 930, p. 193, fig. 103 of Pl. XXXII.
- Sula Abbotti*. Ridgway. (Aves.) Assumption Island. *Proc. U. S. N. M.*, XVI, 1893, No. 953, p. 599.
- Synopeas antennariæ*. Ashmead. (Hym.) Milwaukee, Wis. *Bull. U. S. N. M.*, No. 45, 1893, p. 288.
- Synopeas cornicola*. Ashmead. (Hym.) Kirkwood, Mo. *Bull. U. S. N. M.*, No. 45, 1893, p. 288.
- Synopeas nigripes*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 287, fig. 5 of Pl. XII.
- Synopeas rufipes*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 287.
- Synopeas rufiscapus*.* Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 288.
- Teleas coxalis*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 199.
- Teleas lineaticeps*.* Ashmead. (Hym.) District of Columbia and Virginia. *Bull. U. S. N. M.*, No. 45, 1893, p. 199.
- Teleas pallidipes*.* Ashmead. (Hym.) New Jersey. *Bull. U. S. N. M.*, No. 45, 1893, p. 200, fig. 5 of Pl. VIII.
- Telenomus arzamae*. Riley. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 157.
- Telenomus californicus*. Ashmead. (Hym.) Los Angeles, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 150.
- Telenomus chrysopæ*. Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 159.
- Telenomus clisiocampæ*. Riley. (Hym.) Placer County, Cal., and Westerville, Nebr. *Bull. U. S. N. M.*, No. 45, 1893, p. 160.

- Telenomus cœlodosidis.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 159.
- Telenomus geometræ.* Ashmead. (Hym.) District of Columbia (?). *Bull. U. S. N. M.*, No. 45, 1893, p. 157.
- Telenomus gnophælæ.* Ashmead. (Hym.) Sisson, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 149.
- Telenomus gossypiicola.* Ashmead. (Hym.) Louisiana. *Bull. U. S. N. M.*, No. 45, 1893, p. 156.
- Telenomus gracilicornis.** Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 149.
- Telenomus heliothidis.* Ashmead. (Hym.) Shreveport, La. *Bull. U. S. N. M.*, No. 45, 1893, p. 152.
- Telenomus Hubbardi.* Ashmead. (Hym.) Centerville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 146.
- Telenomus ichthyuræ.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 153.
- Telenomus Koebelei.* Ashmead. (Hym.) Alameda, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 147.
- Telenomus lavernæ.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 158.
- Telenomus maculipennis.** Ashmead. (Hym.) Jacksonville, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 155.
- Telenomus minimus.** Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 152.
- Telenomus nigriscapus.* Ashmead. (Hym.) Michigan. *Bull. U. S. N. M.*, No. 45, 1893, p. 147.
- Telenomus noctuæ.** Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 148.
- Telenomus (♀) pennsylvanicus.** Ashmead. (Hym.) Pennsylvania. *Bull. U. S. N. M.*, No. 45, 1893, p. 160.
- Telenomus persimilis.** Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 150.
- Telenomus podisi.* Ashmead. (Hym.) St. Louis, Mo. *Bull. U. S. N. M.*, No. 45, 1893, p. 158.
- Telenomus pusillus.** Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 146.
- Telenomus spilosomatis.* Ashmead. (Hym.) District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 151.
- Telenomus utahensis.** Ashmead. (Hym.) Wasatch and Salt Lake, Utah. *Bull. U. S. N. M.*, No. 45, 1893, p. 148.
- Thyrolambus astroides.* M. J. Rathbun. (Decap.) Off Havana, Cuba. *Proc. U. S. N. M.*, XVII, 1894, No. 986, p. 83.
- Trichasis arizonensis.* Ashmead. (Hym.) Mount Graham, Ariz. *Bull. U. S. N. M.*, No. 45, 1893, p. 296.
- Trichasis rubicola.* Ashmead. (Hym.) Cadet, Mo., and District of Columbia. *Bull. U. S. N. M.*, No. 45, 1893, p. 296.
- Trichasis rufipes.* Ashmead. (Hym.) District of Columbia, Virginia, Florida, and Missouri. *Bull. U. S. N. M.*, No. 45, 1893, p. 295, fig. 9 of Pl. XII.
- Trichasis virginiensis.** Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 297.
- Trichodactylus quinqueidentatus.* M. J. Rathbun. (Decap.) Near Bluefields, Nicaragua. *Proc. U. S. N. M.*, XVI, 1893, No. 959, p. 660, fig. 7 of Pl. LXXVII.
- Trichopria carolinensis.** Ashmead. (Hym.) Carolina and Pennsylvania. *Bull. U. S. N. M.*, No. 45, 1893, p. 434.
- Trichopria flavipes.** Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 436.
- Trichopria pacifica.* Ashmead. (Hym.) Santa Cruz Mountains, California. *Bull. U. S. N. M.*, No. 45, 1893, p. 436.
- Trichopria pentaplasta.** Ashmead. (Hym.) Washington, D. C., Arlington, Va., and Riley County, Kans. *Bull. U. S. N. M.*, No. 45, 1893, p. 433.
- Trichopria Popenoei.** Ashmead. (Hym.) Riley County, Kans. *Bull. U. S. N. M.*, No. 45, 1893, p. 435.
- Trichopria rufipes.** Ashmead. (Hym.) District of Columbia and Virginia. *Bull. U. S. N. M.*, No. 45, 1893, p. 434, fig. 4 of Pl. XVIII.
- Trichopria Zimmermanni.** Ashmead. (Hym.) Carolina. *Bull. U. S. N. M.*, No. 45, 1893, p. 434.
- Trimorus americanus.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 139, fig. 4 of Pl. VII.
- Trissacantha rugosa.** Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 183.

- Trissolcus murgantiæ*. Ashmead. (Hym.) Baton Rouge, La. *Bull. U. S. N. M.*, No. 45, 1893, p. 163.
- Trissolcus podisi*. Ashmead. (Hym.) Philadelphia, Pa. *Bull. U. S. N. M.*, No. 45, 1893, p. 162.
- Trissolcus rufiscapus*. Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 163.
- Trissolcus thyantæ*. Ashmead. (Hym.) Selma, Ala. *Bull. U. S. N. M.*, No. 45, 1893, p. 163.
- Trogon chryselas*. Richmond. (Aves.) Escondido River, Nicaragua. *Proc. U. S. N. M.*, XVI, 1893, No. 947, p. 513.
- Tropidopria simulans*.* Ashmead. (Hym.) Ottawa, Canada. *Bull. U. S. N. M.*, No. 45, 1893, p. 419.
- Tropidopria tetraplasta*.* Ashmead. (Hym.) Washington, D. C. *Bull. U. S. N. M.*, No. 45, 1893, p. 420.
- Tropidopsis clavata*. Ashmead. (Hym.) St. Vincent, West Indies. *Bull. U. S. N. M.*, No. 45, 1893, p. 402, fig. 2 of Pl. XVII.
- Turtur saturatus*. Ridgway. (Aves.) Amirante Group (Ile Poivre; Ile Alphonse?). *Proc. U. S. N. M.*, XVI, 1893, No. 953, p. 600.
- Typhlops mandensis*. Stejneger. (Rept.) Island of Manda, East Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 970, p. 725.
- Typhlops præocularis*. Stejneger. (Rept.) Kongo Free State, Africa. *Proc. U. S. N. M.*, XVI, 1893, No. 969, p. 709.
- Verticaria Beldingi*. Stejneger. (Rept.) Southern California and Lower California. *Proc. U. S. N. M.*, XVII, 1894, No. 977, p. 17.
- Williamsonia texana*. Fontaine. (Foss. Pl.) Near Glen Rose, Tex. *Proc. U. S. N. M.*, XVI, 1893, p. 278, No. 934, figs. 1 and 2 of Pl. XLIII.
- Xanthodes minutus*. M. J. Rathbun. (Decap.) Off Sandwich Islands. *Proc. U. S. N. M.*, XVI, 1893, No. 933, p. 238.
- Xantusia Henshawi*. Stejneger. (Batr.) Witch Creek, San Diego County, Cal. *Proc. U. S. N. M.*, XVI, 1893, No. 944, p. 467.
- Xenomerus pallidipes*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 184.
- Xenotoma mandibularis*.* Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 363, fig. 7 of Pl. XIV.
- Xenotoma xanthopus*.* Ashmead. (Hym.) New Jersey. *Bull. U. S. N. M.*, No. 45, 1893, p. 363.
- Zamites montanensis*.* Fontaine. (Foss. Pl.) Kootanie Group, Great Falls, Mont. *Proc. U. S. N. M.*, XV, 1892, p. 494, No. 918, fig. 4 of Pl. LXXXIV.
- Zelotypa flavipes*.* Ashmead. (Hym.) Fort George Island, Fla. *Bull. U. S. N. M.*, No. 45, 1893, p. 365.
- Zelotypa longicornis*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 365.
- Zelotypa ruficornis*.* Ashmead. (Hym.) Arlington, Va. *Bull. U. S. N. M.*, No. 45, 1893, p. 366.
- Zelotypa texana*.* Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 365.
- Zygota californica*. Ashmead. (Hym.) Placer County, Cal. *Bull. U. S. N. M.*, No. 45, 1893, p. 373.
- Zygota texana*.* Ashmead. (Hym.) Texas. *Bull. U. S. N. M.*, No. 45, 1893, p. 374.

APPENDIX IX.

LIST OF PAPERS IN THE ANNUAL REPORT AND PROCEEDINGS OF THE NATIONAL MUSEUM, PUBLISHED IN SEPARATE FORM DURING THE YEAR ENDING JUNE 30, 1894.

FROM THE REPORT FOR 1891.

- The Genesis of the National Museum. By G. Brown Goode. pp. 273-380.
- Ethnological collections in the U. S. National Museum from Kilima-Njaro, East Africa. By W. L. Abbott. pp. 381-428, figs. 1-24. (Published prior to July 1, 1893.)
- The Bernadon, Allen, and Jouy Korean collections in the U. S. National Museum. By Walter Hough. pp. 429-488, pls. II-XXXII.
- Shinto, or the mythology of the Japanese. By Romyn Hitchcock. pp. 489-509.
- The ancient burial mounds of Japan. By Romyn Hitchcock. pp. 511-523, pls. XXXIII-LXIII.
- Some ancient relics in Japan. By Romyn Hitchcock. pp. 525-526, pls. LXIV-LXVII.
- Prehistoric naval architecture of the north of Europe. By George H. Boehmer. pp. 527-647, pls. LXVIII-LXXXIV, figs. 25-151.
- First draft of a system of classification for the World's Columbian Exposition. By G. Brown Goode. pp. 649-735.

FROM THE REPORT FOR 1892.

- Japanese wood-cutting and wood-cut printing. By T. Tokuno. [Edited by S. R. Koehler.] pp. 221-244, pls. IV-XIII, figs. 1-5.
- The relation of biology to geological investigation. By Charles A. White. pp. 245-368, pl. XIV.
- Scientific taxidermy for museums. (Based on a study of the United States Government collections.) By R. W. Shufeldt. pp. 369-436, pls. XV-XCVI.
- The shofar; its use and origin. By Cyrus Adler. pp. 437-450, pls. XCVII-C.
- The Crump burial cave. By Frank Burns. pp. 451-454, pl. CI.
- Minute stone implements from India. By Thomas Wilson. pp. 455-460, pls. CII, CIII.
- Comparative oology of North American birds. By R. W. Shufeldt. pp. 461-493.

FROM PROCEEDINGS VOLUME XV.

- No. 916. A description of the golden trout of Kern River, California, *Salmo mykiss aqua-bonita*. By David Starr Jordan. pp. 481-483.
- No. 917. On the occurrence of the spiny boxfish (genus *Chilomycterus*) on the coast of California. By C. H. Eigenmann. p. 485.
- No. 918. Description of some fossil plants from the Great Falls coal field of Montana. By William M. Fontaine. pp. 487-495, pls. LXXXII-LXXXIV.

FROM PROCEEDINGS VOLUME XVI.

- No. 921. Notes on a few fossil plants from the Fort Union Group of Montana, with a description of one new species. By F. H. Knowlton. pp. 33-36, pls. I, II.
- No. 927. Catalogue of the crabs of the family Maiidæ in the U. S. National Museum. By Mary J. Rathbun. pp. 63-103, pls. III-VII.

- No. 930. Scientific results of explorations by the U. S. Fish Commission steamer *Albatross*. No. xxiii. Report on the Actiniæ collected by the U. S. Fish Commission steamer *Albatross* during the winter of 1887-'88. By J. Playfair McMurrich. pp. 119-216, pls. xix-xxxv.
- No. 931. On the status of the gray shrike collected by Captain Blakiston in Yezo, Japan. By Leonhard Stejneger. pp. 217-218.
- No. 932. Throwing-sticks from Mexico and California. By Otis T. Mason. pp. 219-221, figs. 1-6.
- No. 933. Scientific results of explorations by the U. S. Fish Commission steamer *Albatross*. No. xxiv.—Descriptions of new genera and species of crabs from the west coast of North America and the Sandwich Islands. By Mary J. Rathbun. pp. 223-260.
- No. 934. Notes on some fossil plants from the Trinity Division of the Comanche Series of Texas. By William M. Fontaine. pp. 261-282, pls. xxxvi-xliii.
- No. 935. Observations on the blind crayfishes of Indiana, with a description of a new subspecies, *Cambarus pellucidus Testii*. By W. P. Hay. pp. 283-286, pls. XLIV, XLV.
- No. 936. The shofar; its use and origin. By Cyrus Adler. pp. 287-301, pls. XLVI-XLIX.
- No. 937. List of Diatomaceæ from a deep-sea dredging in the Atlantic Ocean off Delaware Bay by the U. S. Fish Commission steamer *Albatross*. By Albert Mann. pp. 303-312.
- No. 938. Description of a new species of Cyprinoid fish, *Couesius Greeni*, from the head waters of the Frazer River, in British Columbia. By David Starr Jordan. pp. 313, 314.
- No. 939. Note on the wall-eyed pollock (*Pollachius chalcogrammus fucensis*) of Puget Sound. By David Starr Jordan. pp. 315-316.
- No. 940. Preliminary report on the molluscan species collected by the United States scientific expedition to West Africa in 1889-'90. By Robert E. C. Stearns. pp. 317-339.
- No. 941. On rare or little-known mollusks from the west coast of North and South America, with descriptions of new species. By Robert E. C. Stearns. pp. 341-352.
- No. 942. Scientific results of explorations by the U. S. Fish Commission steamer *Albatross*. No. xxv. Report on the mollusk-fauna of the Galapagos Islands, with descriptions of new species. By Robert E. C. Stearns. pp. 353-450.
- No. 943. Scientific results of explorations by the U. S. Fish Commission steamer *Albatross*. No. xxvi.—Report on the Pteropods collected by the U. S. Fish Commission steamer *Albatross* during the voyage from Norfolk, Va., to San Francisco, Cal., 1887-'88. By James I. Peck. pp. 451-466, pls. LIII-LV.
- No. 944. Diagnosis of a new California lizard. By Leonhard Stejneger. p. 467. (An advance edition of this paper was published during the preceding fiscal year.)
- No. 945. Description of a supposed new species of *Odontophorus*, from southern Mexico. By Robert Ridgway. pp. 469-470.
- No. 946. A subtropical Miocene fauna in Arctic Siberia. By William Healey Dall. pp. 471-478, pl. LVI.
- No. 947. Notes on a collection of birds from eastern Nicaragua and Rio Frio, Costa Rica, and a description of a supposed new *Trogon*. By Charles W. Richmond. pp. 479-532.
- No. 948. Description of a new species of fruit bat, *Pteropus aldabrensis*, from Aldabra Island. By Frederick W. True. pp. 533-534.
- No. 949. Notice of the crustaceans collected by the United States scientific expedition to the west coast of Africa. By James E. Benedict. pp. 535-541.

- No. 950. A descriptive catalogue of the harvest spiders (Phalangiidæ) of Ohio. By Clarence M. Weed. pp. 543-563, pls. LVII-LXIX, fig. 1.
- No. 951. Scientific results of the United States eclipse expedition to West Africa, 1889-'90. Report upon the Insecta, Arachnida, and Myriopoda. By C. V. Riley. pp. 565-590, pl. LXX, figs. 1-13.
- No. 952. On some fossil Unios and other fresh-water shells from the drift at Toronto, Canada, with a review of the distribution of the Unionidæ of north-eastern North America. By Charles T. Simpson. pp. 591-595.
- No. 953. Descriptions of some new birds collected on the islands of Aldabra and Assumption, northwest of Madagascar, by Dr. W. L. Abbott. By Robert Ridgway. pp. 597-600.
- No. 954. Notes on a small collection of mammals from the Tana River, East Africa, with descriptions of new species. By Frederick W. True. pp. 601-603.
- No. 955. Remarks on the avian genus *Myiarchus*, with special reference to *M. yucatanensis*, Lawrence. By Robert Ridgway. pp. 605-608.
- No. 956. On a small collection of birds from Costa Rica. By Robert Ridgway. pp. 609-614.
- No. 957. Notes on a third installment of Japanese birds in the Science College Museum, Tokyo, Japan, with descriptions of new species. By Leonhard Stejneger. pp. 615-638.
- No. 958. Land shells of the genus *Bulimulus* in Lower California, with descriptions of several new species. By William Healey Dall. pp. 639-647, pls. LXXI, LXXII.
- No. 959. Descriptions of new species of American fresh-water crabs. By Mary J. Rathbun. pp. 649-661, pls. LXXIII-LXXVII.
- No. 960. Scientific results of explorations by the U. S. Fish Commission steamer *Albatross*. No. xxvii.—Catalogue of a collection of birds made in Alaska by Mr. C. H. Townsend during the cruise of the U. S. Fish Commission steamer *Albatross* in the summer and autumn of 1888. By Robert Ridgway. pp. 663-665.
- No. 961. A revision of the genus *Formicarius*, Boddaert. By Robert Ridgway. pp. 667-686.
- No. 962. Description of a new storm petrel from the coast of western Mexico. By Robert Ridgway. pp. 687-688.
- No. 963. Description of a new species of mouse (*Sitomys decolorus*) from Central America. By Frederick W. True. pp. 689-690.
- No. 964. Description of a new *Geothlypis* from Brownsville, Tex. By Robert Ridgway. pp. 691-692.
- No. 965. The proper generic name of the tunnies. By Theodore Gill. pp. 693-694.
- No. 966. The shell heaps of the east coast of Florida. By De Witt Webb. pp. 695-698, pls. LXXVIII-LXXXIV.
- No. 967. Description of a new Blennioid fish from California. By Tarleton H. Bean. pp. 699-701, fig. 1.
- No. 968. Notes on Myriapoda from Loanda, Africa, collected by Mr. Heli Chatelaineq including a description of a new genus and species. By O. F. Cook. pp. 703-708.
- No. 969. Description of a new species of blind snakes (Typhlopidae) from the Kongo Free State. By Leonhard Stejneger. pp. 709-710.
- No. 970. On some collections of reptiles and batrachians from East Africa and the adjacent islands, recently received from Dr. W. L. Abbott and Mr. William Astor Chanler, with descriptions of new species. By Leonhard Stejneger. pp. 711-741.
- No. 971. Notes on recent collections of North American land, fresh-water, and marine shells received from the U. S. Department of Agriculture. By Robert E. C. Stearns. pp. 743-755.

- No. 972. On the relationships of Taylor's mouse, *Sitomys Taylora*. By Frederick W. True. pp. 757-758.
- No. 973. Notes on the natural history of Aldabra, Assumption, and Gloriosa islands, Indian Ocean. By W. L. Abbott. pp. 759-764, fig. 1.
- No. 974. Remarks on Japanese quails. By Leonhard Stejneger. pp. 765-769.
- No. 975. Notes on birds from Central Mexico, with descriptions of forms believed to be new. By Pierre Louis Jouy. pp. 771-791.

FROM PROCEEDINGS VOLUME XVII.

- No. 976. Notes on mammals of Baltistan and the Vale of Kashmir presented to the National Museum by Dr. W. L. Abbott. By Frederick W. True. pp. 1-16.
- No. 977. Description of a new lizard (*Verticaria Beldingi*), from California. By Leonhard Stejneger. pp. 17-18.
- No. 978. Note on a blue mineral, supposed to be ultramarine, from Silver City, New Mexico. By R. L. Packard. pp. 19-20.
- No. 979. Descriptions of two new species of crabs from the western Indian Ocean presented to the National Museum by Dr. W. L. Abbott. By Mary J. Rathbun. pp. 21-24.
- No. 980. Description of a new genus and two new species of African fresh-water crabs. By Mary J. Rathbun. pp. 25-27.
- No. 986. Descriptions of a new genus and four new species of crabs from the Antillean region. By Mary J. Rathbun. pp. 83-86 (advance sheet).
- No. 999. Diagnoses of new North American mammals. By Frederick W. True. pp. 241-243 (advance sheet).
- No. 1006. Diagnoses of some undescribed wood rats (genus *Neotoma*) in the National Museum. By Frederick W. True. pp. 353-355 (advance sheet).

APPENDIX X.

LECTURES AND MEETINGS OF SOCIETIES.

The following papers were read at the meeting of the National Academy of Sciences in April, 1894:

- I. Histological characteristics of certain Alpine plants. By G. L. Goodale.
- II. Corrosions by roots. By G. L. Goodale.
- III. An investigation of the aberration and atmospheric refraction of light, with a modified form of the Loewy prism apparatus. By George C. Comstock.
- IV. Biographical memoir of John Le Conte. By Joseph Le Conte.
- V. The coral reefs of the Bermudas. By Prof. Alexander Agassiz.
- VI. The so-called serpulæ reefs of the Bermudas. By Prof. Alexander Agassiz.
- VII. The bathymetrical extension of the pelagic fauna. By Prof. Alexander Agassiz.
- VIII. New method of determining the relative affinities of certain acids. By M. Carey Lea.
- IX. On the change of Young's modulus of elasticity with variation of temperature, as determined by the transverse vibration of bars of various temperatures. By A. M. Mayer.
- X. On the production of beats and beat-tones by the covibration of two sounds so high in pitch that when separately sounded they are inaudible. By A. M. Mayer.
- XI. On the motions of resonators and other bodies caused by sound vibrations, with experimental illustrations; also a reclamation. By A. M. Mayer.
- XII. On late researches on the variations of latitude. By S. C. Chandler.
- XIII. On the infra-red spectrum. By Prof. S. P. Langley.
- XIV. The bacteria of river water. By Dr. John S. Billings, U. S. A.
- XV. The influence of light upon the bacillus of typhoid, and the colon bacillus. By Dr. John S. Billings, U. S. A.
- XVI. Recent gravity instruments and results. By Dr. T. C. Mendenhall.
- XVII. The geographical distribution of fresh-water fishes. By Dr. Theodore Gill.
- XVIII. Note on a possible increase in the ultimate defining power of the microscope. By C. S. Hastings.
- XIX. The internal energy of the wind. By Prof. S. P. Langley.

The Saturday lectures for the season 1894 were embraced in three courses, as follows:

ANTHROPOLOGY (SOMATOLOGY).

- February 17.*—Relations of man and microbe. By Brig. Gen. George M. Sternberg.
February 24.—The mechanism of sensation. By Dr. Frank Baker.
March 3.—The evolution of the hand. By F. A. Lucas.
March 10.—The Mongol and his home. By Hon. W. W. Rockhill.
March 17.—Giants and pygmies. By Dr. Daniel G. Brinton.

GEOLOGY (GENERAL).

- March 24.*—The materials of the earth's crust. By Dr. George H. Williams.
March 31.—The dislocations of the earth's crust. By Dr. George F. Becker.
April 7.—The structure of the Appalachian Mountains. By Bailey Willis.
April 14.—The sculpturing of the Appalachian region. By Marius R. Campbell.

ANTHROPOLOGY (DYNAMIC).

April 28.—Psychology as science and art. By Elmer Gates.

May 5.—Exercise as a factor in development. By Dr. William Hammond.

May 12.—Types of aboriginal beliefs. By Frank Hamilton Cushing.

May 19.—Ancient eastern politics. By Dr. Cyrus Adler.

May 26.—The development of higher education. By Hon. John W. Hoyt.

The course on old and modern methods of engraving, by Mr. S. R. Koehler, comprised nine lectures, as follows:

February 6.—Introduction. Relief engraving.

February 9.—Intaglio engraving: Line engraving (graver work).

February 13.—Intaglio engraving: Etching.

February 16.—Intaglio engraving: Dry-pointing; mezzotinting; stippling; aquatinting; soft-ground etching, etc.

February 20.—Planographic processes (lithography, etc.). Substitute processes.

February 23.—The photo-mechanical processes: Introduction. Relief processes (line work).

February 27.—The photo-mechanical processes: Relief processes (half tone); intaglio processes.

March 2.—The photo-mechanical processes: Collographic processes; photolithography; the Woodburytype.

March 6.—Print collections. Engraving as a subject of study.

PART II.

PAPERS DESCRIBING AND ILLUSTRATING COLLECTIONS IN THE U. S. NATIONAL MUSEUM.

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PRIMITIVE TRAVEL AND TRANSPORTATION.

BY

OTIS TUFTON MASON,

Curator, Department of Ethnology, U. S. National Museum.

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GENERAL STATEMENT.

Invention has to do with the resources and forces of nature applied to human weal. In the earth, the waters, and the air, in the composite activity of the sun, in cosmic matter and powers little understood, are to be found the materials and servants by whose ministrations the cunning spirit of man effects those artificialities of life and culture which constitute the body of human industries, æsthetic arts, languages, social life, commerce, philosophies, and cults.

The complete account of the human species acquiring the resources of nature and dominating and understanding her forces is the history of culture.

The human species has approached, and in its best estate does now approach, the material resources of the earth under the impulse of five sets of motives, to wit:

- (1) To explore, secure, and domesticate them.
- (2) To change their form, to manufacture them.
- (3) To move them and themselves artificially.
- (4) To exchange, measure, and value them.
- (5) To consume or to enjoy them.

The progress of the world started with these five primitive, fundamental activities. It is the purpose of the present publication to consider the third class, in their earliest forms and in relation to the others, so far as they are illustrated in the U. S. National Museum.

The manipulation of the material resources of nature involves in the second place the knowledge, the domestication, and the training of

force or power, which may be thus set forth in its sources, epochs, and sciences.

Power of—	Epoch of—	Science.
1. Man	The hand.....	Anthropokinetics.
2. Beast	Domestication.....	Zookinetics.
3. Elastic springs.....	War and hunting.....	Elaterokinetics.
4. Fire.....	Mastery	Thermokinetics or pyrokinetics.
5. Wind	The sail	Anemokinetics.
6. Water	Rude machines.....	Hydrokinetics.
7. Steam.....	Machinery.....	Atmokinetics.
8. Chemism.....	Scientific industry.....	Chemykinetics.
9. Electricity.....	Ideal invention in speech light, and motion.	Electrokinetics.
10. Light	Cosmic invention.....	Photokinetics.

Among these sources of motion or motors it will be quickly noted that the first two derive their activity from animal muscle, the rest through some sort of device that takes the place of the human body. It will also be understood that for the purposes of invention the powers or forces may again be divided into two classes, the first being man power, the second class including all the rest enumerated. All artificial work goes back to man, all work is imitation of man's work, the primitive form of every moving device is the human body.¹

Nature furnishes ready motive power in moving air and water. All other forms of mechanical motion, not excepting muscular power, require the application of heat, and this is obtained through combustion.

The mechanical nomenclature of all language is largely derived from the bodies of animals. Thus in English we have the head of a ship, river, lake, jetty, bolt, etc.; the brow of an incline; the crown of an arch; the toe of a pier; the foot of a wall; the forefoot, heel, ribs, waist, knees, skin, nose, and dead eyes of a ship; also turtlebacks and whalebacks; the jaws of a vice; the claws of a clutch; the teeth of wheels; necks, shoulders, eyes, nozzles, legs, ears, mouths, lips, cheeks, elbows, feathers, tongues, throats, and arms; caps, bonnets, collars; sleeves, saddles, gussets, paddles, fins, wings, crabs, horns, donkeys, monkeys, and dogs; flywheels, running nooses, crane necks, grasshopper engines, etc.²

The use of these natural forces and their application in the five great classes of industry above named gradually led invention to the discovering or devising of mechanical powers, to sacrifice time in order to overcome resistance too great for individual effort, to secure the cooperation of many persons or animals in one work, and to make effective the forces just mentioned in ways innumerable. The mechanical

¹Cf. J. H. Cooper, *Iconographic Encyclopedia*, vi, p. 193, and the author's work on the "Origins of Invention," London, 1894.

²Cf. Jeremiah Head, *Rep. Brit. Assoc.*, 1893, p. 862.

powers, in short, make possible the differentiation of employment and the organized cooperation which constitute a higher grade of industry.

The mechanical powers, as they are called, seem to have come into vogue in the following order:

(1) The weight, for hammers, traps, and pressure; later on for machinery.

(2) The elastic spring, in bows, traps, machines.

(3) Inclined and declined plane, in locomotion and transportation.

(4) The lever, of all kinds.

(5) The wedge, in riving and tightening.

(6) The sled, on snow or prepared tracks.

(7) The roller, for loads and in machine bearings.

(8) The wheel, in travel and carriage.

(9) Wheel and axle in many forms.

(10) Pulleys, with or without sheaves.

(11) Twisting, shrinking, and clamping devices.

(12) The screw.

It will be observed that for working with the forces enumerated, with or without the mechanical powers, tools and utensils are necessary in order to break, pierce, divide, unite, contain, move, and hold fast materials, and to make it possible for work to be done. In another publication the author will discuss the aboriginal American mechanic and his industries, so it is not necessary here to enlarge upon this intricate subject. Suffice it to say that not only every tool, but device for transportation and work, includes three distinct parts, to wit:

(1) The working part, which does the moving, breaking, battering, chipping, abrading, polishing, cutting, perforating, and so on. This portion of all appliances maintains a remarkably conservative plan of functioning. In the sled, for instance, or the sailing craft, the line and curve of runners or the strakes have undergone little change. The material and manipulation of the mechanical powers have changed amazingly, but no one can alter the *modus operandi* or the equation of any one of them.

(2) The manual part, or that connected with the human body or other prime mover that takes its place. The functioning part of a machine, to repeat, changes little, but the narrative of the harness of the motor or motive power constitutes the history of machinery. A very old-fashioned wagon differs from the latest freight train chiefly in the intricate engine and expensive track. The difference between a *kaiak*, with ribs of driftwood and skin of seal hide, and a cruiser, with ribs and skin of steel, is in the mode of pushing them through the water.

(3) The attachment or attaching devices of tools and machines. In the woman's knife the blade is wedged, glued, or tied into the handle. In the sled the dog and the sled are made one by hooks, toggles, frogs, etc. This subject of binding, uniting, attaching, detaching,

can not be overlooked in the study of travel and transportation. Its relation to progressive culture, to geography, and climate is most interesting. It will be seen in the progress of this study that environmental grades of culture, and tribal idiosyncrasies may be excellently differentiated thereby.

Again, with each art goes a series of devices which may be classed under the general name of receptacles, their only functions being to contain other perishable or precious or fragile things. The sewing woman has her housewife, the artisan his tool chest, and every one his pockets. In the travel and transportation arts these containers go by a thousand names. The general term "package," however, has been adopted to include them all. The carrying trade has introduced an enormous variety of devices for packing and enriched the vocabulary with such words as barrel, box, pint, quart, peck, bushel, cask, bag, sack, crate, hamper, hogshead, and tierce. Furthermore, the conveniences of packing, as well as strength for transport, has reduced many of these words to standards of measure and fixed the metrics of carrying; such words as barrel, tub, firkin, and load have definite meaning of contents gauged by the carrier and now by law. These devices are sometimes permanent, but oftener thrown away at the end of the journey.

Among the inventions upon which ethnic and geographic traits are fastened the packages should be carefully studied. It is these that in the present enormous commerce are counterfeited for the purpose of gain and fraud. W. R. Carles represents a Korean peasant woman not only bearing a burden on the head, done up in somewhat local fashion, but she has under her left arm a number of eggs wrapped in straw and looking not unlike strings of sausage¹ (fig. 1).

The modifications of all human phenomena that are the product of invention are far-reaching. They include changes—

(1) In the things invented or products of invention, commonly called inventions.

(2) In all the materials, processes, and apparatus involved.

(3) In the mental condition and powers of the inventor.

(4) In the rewards and benefits of the invention.

(5) In society, resulting from the invention.



Fig. 1.

KOREAN WOMAN TOTTING MEAL AND CARRYING EGGS.

From a figure in Carles's "Life in Korea."

¹ See figure on p. 63, "Life in Korea," New York, 1894, Macmillan & Co.

These changes have been very marked under the influence of travel and the carrying trade. A palace train does not resemble a savage woman's baby frame greatly, neither is a huge steamer like the sack on the back of a roustabout. The bustle of making and moving the former in each case is vastly greater. As for rewards, the savage woman gets nothing beyond a little easing of her load, and the rouser receives a few cents a day. The intellectual impulses in the beginning or copying stage and the ending or creative stage of an epoch-making invention differ in speed and momentum. And, as for the changes in society, nothing has contributed more to that end than beasts of burden and traction, ships and railroad trains.

Yet the old transportation survives everywhere and obtrudes itself into the new. The most costly steamer is compelled by law to carry for each passenger a little life-preserver as rude as that on which the Assyrian soldier floated himself across a stream, and trains must always have on board folk-appliances.

Among the negro population of Africa and in other savage communities carrying is a fine art. Fletcher and Kidder represent a woman bearing at the same time freight on her head and steadying it with the right hand, while she sustains her child on the lumbar region, wrapped in her shawl, and supported by the left hand.

All the changes of exploiting nature's resources, forces, and powers—of the art of inventing—have followed the laws of progress from—

- (1) Naturism to greater and greater artificiality.
- (2) Simplicity or monorganism to complexity or polyorganism.
- (3) Clumsiness to delicacy and economy.
- (4) Discomfort to comfort.
- (5) Solitary work to cooperation.
- (6) Individual weal to common weal.

All of these laws apply to each class of work in the Patent Office, and it will be seen there that the number of patents concerned with the working out of this scheme in traveling devices is very great.

From this point of view the climax of invention in any line of activity, individual or social, is the intentional and cooperative application of all knowledge to the production of new tools, machines, words, fine arts, social structures, and philosophies. This purposeful and systematic devising is the climax of the process. But in the beginning it was not so. Industries, fine arts, languages, social structures, and beliefs almost created themselves, but each had in its processes and results the germs and becomings of all future human achievements.

The relations of each element above mentioned in each class of notions to the earth as it is constituted rather than to the earth as a homogeneous unit can not be neglected. In no class of human activities is the careful study of geography more demanded. This is so true that if the clothing, shoes, pack, and appliances of a traveler or porter be laid before a student of this subject, he will be able to describe with

tolerable accuracy the region or culture area, its temperature, weather, geographic features, and productions.¹

Now every substance and thing before mentioned scarcely ever exists at first where it is needed or is used up where it is first taken. The same is true of what is made out of those, and what is made out of these secondary, tertiary, and further products, the result of each activity being the groundwork of another. None of them is wanted where it is produced. Hence the locomotive activity is a kind of middle trade in the most comprehensive and varied sense, a go-between and a carry-between for them all ad infinitum.

Hence the endless running to and fro of men and women, covering in a single day fifty times the distance from the sun and back again. The miner, the quarryman, the gem collector; the gleaner, the lumberman, and the farmer of every type; the hunter, the fisherman, and herdsman, all have to go and to haul all sorts of things to their work, before they deliver the goods to the manufacturer. After endless goings, carryings, and haulings about the establishment, the transportation has scarcely begun. The products must go away by land or by water, either to some other manufacturer to be further modified, or they must hie away to the centers of shipment; and thence, after having been lifted and lugged again and again, these products in new packages are ready for a journey to the seats of commerce; first of wholesale, then of retail. Now begin the little carryings of the endless procession of shoppers and porters. There would hardly seem to be anything else to do but to go and fetch.

The carrying industry not only acts as middleman between all other activities, but in its operations it absorbs a great deal of the life of the others. The mineral kingdom is the roadbed of water, snow, and earth over which locomotion passes. The inventor has not been idle in changing them for the historic evolution of the carrying art. The vegetable kingdom, in its forms of textile and timber, have always been indispensable to the mechanism of transportation. Animal products appear in receptacles, bone ware, rawhide lines, and a million kinds of leather bags. The building of baby cradles, carrying frames, wagons, boats, saddles, cars, not to mention clothing of special material and pattern for this industry, occupy thousands of men and women. Now in the primitive status the same person may in his life play many of these parts, or all the parts necessary. But these activities have to be performed by somebody always. It would be perfectly safe to say that every trade on earth did some specialized work for the traveler and common carrier.

The three kingdoms of nature have been man's teachers. The very conduct of the earth, the waters, the air has provoked him to movement and transporting. The powers of nature keep the solid earth on

¹ See Hahn's Map of Plant Industries, Petermann's Mittheilungen, Jan., 1892: Proc. Roy. Geog. Soc., XIV, p. 182.

the move, and the surface material, with all human beings, are impelled along. Every thing that floats in the water is an object lesson in locomotion. The winds drive the clouds, which go away never to return; it scatters the leaves, and brings the snow or the summer.

The living kingdoms are more instructive and suggestive. The beaver, the bird, the lamprey eel, the ant, and the bee are all industrious carriers. Their perseverance and strength amaze the modern engineer. In a certain sense they were the instructors of man in the arts of travel and transportation. There are those who emphasize these facts to the great disparagement of our species. But after all it is the genius of invention which appropriates, dominates, and utilizes the whole world. It is true that they can be taught a little discretion in such matters. Jeremiah Head tells us that the donkey at Carisbrooke



Fig. 2.

DONKEY CARRYING WATER JARS IN CRATE.

From a photograph in the U. S. National Museum, by Rev. E. F. X. Cleveland.

castle draws water from a deep well by a treadmill arrangement just as well as a man could do it. He watches the rope on the barrel till the full pail rises above the parapet of the well, then slacks back a little to allow it to be rested thereon, and only then leaves the drum and retreats to the stable.¹

Bearing on the head had a different effect on the ceramic art from that of burden bearing on the back or on beasts (fig. 2). The former is illustrated in the modern pitcher, with handle on the side, with the bulge near the bottom to bring the center of gravity as low down as possible, with the bottom concave, and often fitted with an extra rim, the lineal descendant of the carrier's head pad. There are features of the pitcher which have been occasioned by other than carrying motives, but the forms had the origin here described.

¹ Rep. Brit. Assoc., 1893, p. 861.

All handles and rims have their original motive in the carrying activity, and these elements when made decorative are survivals from the utilitarian epoch of the thing. Doubtless, carrying devices in dugout stems, in pottery, and in hard textiles had as their natural prototypes objects which could be utilized with little modification. But it is also true that the genius of modification is the most marked human characteristic. The gourd with the receding bottom may be the prototype of the jar of the same form. It is also doubtless true that Sandwich Islanders selected the seeds of those gourds that had the most convenient carrying form, and these seeds were planted as a matter of course. After the same motive there are examples from various peoples of tying strings about gourds to give attachment to the carrying strap. This form is imitated in pottery and basketry after it had been worked out in gourd culture.

The illustration here given (pl. 1) is from a photograph in the U. S. National Museum, taken by Hillers, of the Geological Survey. The woman rests the water jar on the head, without the pad, and the concave bottom shows how at the behest of the woman's comfort the shape of the vessel has been modified. The dark band at the bottom is the boundary line of what would be the bottom ring of the sling if one were there.

Upon this artistic side the history of human movements over the earth and of the journeys which its productions have taken at the bidding and for the comfort of our species is like an enchanted dream. It is as though many ages back a naked man had started out in the world and was now returning clothed in all the earth's finest fabrics; the winds, the ocean currents, fire and lightning rowing his boat or drawing his chariot. Through what experiences this one man must have passed to be in himself the epitome of all pedestrians, riders, and carriers and to have used every vehicle and sailing craft that ever existed.

Traffic in its complexity and changes is also characterized by its noises. Surely the quiet peon urging his way along his lonely path is very different from the roar, the din, the rattle, the bells, the whistles one hears on Cortlandt street. The latter is a kind of Wagnerian symphony of transportation, in which discord heightens the harmony.

Primitive commerce and all the carrying and running involved in primeval arts connected with food, shelter, clothing, rest, enjoyment, news carrying, and war were accomplished on the heads or foreheads, shoulders or backs, or in the hands of men and women; and civilization while it has invented many ways of burden bearing, finds also an endless variety of uses for the old methods. How many thousands of our fellow-creatures are still in this condition of mere beasts of burden! It is, for instance, only a few years since the invention of the passenger and freight elevator began to supplant that train of "hod carriers," who have been since the beginning of architecture bearing

EXPLANATION OF PLATE 1.

ZUÑI WOMAN CARRYING WATER.

The water jar among the Pueblo Indians performs a double function; namely, for carrying and for storage.

Carrying water on the head, and not on a beast or in a sling or canteen, requires the bottom of the jar to be either round and accompanied with a sustaining pad for the head and for the ground, or to be concave on the bottom, as in this plate. In most examples of Pueblo pottery the decorations are pictorial and symbolic.

Jars with concave bottoms are extremely rare in ancient American collections, but carrying with the headband is in vogue from Smith Sound to Patagonia. It is possible, therefore, that the method here figured is post-Columbian.

The woman is partly dressed for the occasion in blankets of her own handiwork in dark blue, red, and white wool, and adorned with a silver necklace made by a native jeweler. Her leggings are for out-of-door work. The sole of the moccasin has attached to it for the "upper" an entire deerskin, and as the old footing wears out, it is renewed at the sacrifice of the top, which constantly decreases in size. The upper is neatly doubled and wrapped about the limb. The carrying of water for all purposes was an unremitting task with the ancient cliff and mesa dwellers.



ZUÑI WOMAN CARRYING WATER.
From a photograph in the U. S. National Museum.

upward to its completion every wooden and brick structure in the world.

To get something like an adequate conception of the enormous amount of labor performed by human backs, calculate the weight of every earthwork, mound, fort, canal, embankment, wooden, brick, metal, and stone structure and fabrication on earth. These have all been carried many times and elevated by human muscle. In the light of this contemplation, Atlas, son of Heaven and Earth, supporting on his shoulders the pillars of the sky, is the apotheosis of the human son of toil, and the gaping wonder of archæologists over the hand-made structures of Thebes, Palenque, Carnac, and Salisbury Plain subsides to the level of a mathematical problem. Indeed, the great majority of earthworks, mounds, menhirs, cairns, cromlechs, dolmens, and megalithic structures now to be seen witnessed the exertions of no other artisan than the human carrier and mover.¹

The traffic by land and by sea has grown tenfold since 1850. The carrying trade is at present one of the chief occupations of men, as may be seen by the numbers employed on railways and in seagoing shipping.

	Railways.	Shipping.	Total.
Europe	1,540,000	550,000	2,090,000
United States.....	874,000	60,000	934,000
Other countries.....	480,000	95,000	575,000
Total	2,894,000	705,000	3,599,000

The gross receipts of the carrying trade in which the above men are employed amount to about £650,000,000 sterling per annum.²

The incentives to going about and transportation are:

- (1) The necessity of food and comfort, the daily round.
- (2) The procurement of tools and materials necessary to the getting and preparing of the food and comforts of life, herding and droving.
- (3) Fear and desire for quiet, individual and social.
- (4) Love of conquest, the movements of hordes.
- (5) Desire to see and know what is beyond, exploration and intelligence.
- (6) Gold and other rare treasures, prospecting.
- (7) Religious pilgrimage.
- (8) Involuntary movements.

¹For illustrations of women as beasts of burden, see the author's work, "Woman's Share in Primitive Culture," New York, 1894, chapter vi; Schoolcraft, History, etc., of the Indian tribes of the United States, vi, plate opposite p. 560; Wood, "Uncivilized Races," I, p. 330 et seq.; Lucien Carr, "Mounds of the Mississippi Valley," and Isaac McCoy, "Coal Carriers in the West Indies," for calculation of the time required to build an earth mound.

²Mulhall, Contemp. Rev., 1894, p. 820.

Between the gratification centers are often long, cheerless spaces to be crossed and to increase the journey.

In the satisfaction of these cravings the whole earth was occupied long ago by unlettered peoples. They walked most of the way; they swam and paddled in shallow waters; they followed the fishes, the birds, the mammals, the streams, the winds, the voices innumerable within them. No modern Crusoe has failed to see in the shore-sand the footprints of those fearless pedestrians and guideless sailors who in the darkness of human ignorance felt their way to nearly every corner of the world:

The great forests never supported large aboriginal populations. There is a continuous tract north of the St. Lawrence, in Quebec and Ontario, extending to Hudson Bay and Labrador, 1,700 miles in length from east to west and 1,000 miles from north to south. Another tract lies in Washington State and British Columbia. A third occupies the valley of the Amazon, embracing much of northern Brazil, eastern Peru, Bolivia, Ecuador, Colombia, and Guiana—a region 2,100 miles long by 1,300 wide. In Africa, in the valley of the Kongo, including the head waters of the Nile to the northeast and those of the Zambesi on the south, is a forest region not less than 3,000 miles from north to south and of vast width from east to west. In Siberia, from the plains of Obi to the valley of the Indigirka, embracing the valleys of the Yenisei, Olenek, Lena, and Yana, is a timber belt more than 1,000 miles from north to south and a length of 3,000 miles from east to west. In Yenisei, Lena, and Olenek are thousands of square miles where no human being has ever lived.¹ The same is true of arid regions. To keep the tribes of men in fraternal or inimical contact and to enable the progressive races to enjoy the fruits of the whole earth these uninhabitable regions had to be traversed. First they discouraged, then they demanded locomotion.

Bandelier says: "In every age gold has presented one of the strongest means of enticing men from their homes to remote lands, and of promoting trade between distant regions and the settlement of previously uninhabited districts."²

It has been previously intimated that one of the results of all inventions is the profound modification of society. In a special sense, society has had to adapt itself to the travel and traffic art. No two areas of the earth are alike in resources. Quite the contrary, all habitable places superabound in some requisite of human existence, some raw material, or spring, or good landing place, or sunny exposure, or source of power, or pastureland. The extreme variety of physiographic characteristics set agoing the activities we call traffic. Note that each

¹ From the Youth's Companion.

² "The Gilded Man," New York, 1893, D. Appleton & Co., mentions on page 1, the Argonauts, Hercules seeking the golden apples of the Hesperides, the settlement of the Phœnicians in Spain, and the journeys to Ophir.

little group or family has had its daily round of cares and then lain down to rest; the feet were tired as well as the hands. A day's journey for all this group combined is the family round of activity.

Note again, that this little group in the course of a year has a succession of seasons, and then the circle returns into itself. There is the hunting month, the fishing month, the planting month, the hoeing month, the berry month, and so on, till the year is exhausted. The amount of going, no matter where, of the whole group is the circle of annual activity.

In the third place, it is almost impossible for one of these little groups in its daily round and annual circle to be so shut off from the rest of mankind as not to come in contact with other groups beyond their territory, and they carry on war or trade with them, mutually invading and being invaded. The total of all contacts let us call the sphere of influence or of contact.

Again, there is an outside world, of which our group has heard, and in former years their ancestors moved in a part of it. Some of their own men have been there and relate marvelous stories on their return. The memory of the outside world is treasured up in story or myth or song, or acted in the tribal drama. They will tell in the southland of the place where there is neither sun nor trees and the people make their boats of sea-monsters' skins. Or perhaps there may be in western America the tale of a country where the trees are hollow.

At any rate, ethnologists do not know of a time when there was not a deal of moving about over the earth and going away from home and returning, or of getting into a great highway or gulf stream of travel. These journeyings became world encompassing at the close of the fifteenth century of our era. These movings may be called the streams of human commerce and acquaintance.

Finally, there is a heritage of experience and wisdom, a commerce of inventive thought, moving over the globe ever like the currents of the atmosphere. Temperatures, rainfalls, winds, hygienic conditions, depend upon the air currents. But here it is meant that there are thought movements into which and out of which our group may get themselves to modify or to crystallize their activities, their modes of travel and commerce especially. The social life of a people in its goings therefore includes—

- (1) Their daily round of actions from bed to bed.
- (2) Their annual circle of activities from year to year.
- (3) The sphere of influence or outside relations.
- (4) The streams of commerce, their contact with them.
- (5) The currents of intellectual force, more or less continuous in time and place.

Mr. Ravenstein gives from Russian sources an interesting account of the manner in which the Orochons (Tungus stock) on the upper Amur spend their hunting year. In March they go on snowshoes over

snow, into which, at that season, cloven-footed animals sink, and shoot elks, roe, and musk deer, wild deer and goats; the tent being fixed in valleys and defiles where the snow lies deepest. In April the ice on the rivers begin to move, and the huntsman, now turned fisherman, hastens to the small rivulets to net his fish. Those not required for immediate use are dried against the next month, which is one of the least plentiful in the year. In May they shoot deer and other game, which they have decoyed to certain spots by burning down the high grass in the valleys so that the young sprouts may attract the deer and goats. June supplies the hunter with antlers of the roe. These they sell at a high price to the Chinese for medicinal purposes. The Chinese merchants come north in this month, bringing tea, tobacco, salt, powder, lead, grain, butter, etc., so that a successful huntsman is then able to provide himself with necessaries for half the year. In July the natives spend a large part of the month catching fish, taken with nets or speared with harpoons. They are able also to spear the elk, which likes a water plant growing in the lakes. It comes down at night, wades into the water, and, while engaged tearing at the plant with its teeth, is killed by the huntsman. In August they catch birds, speared at night in the retired creeks and bays of the river and lakes. Their flesh, except that of the swan, is eaten, and the down is exchanged for ear and finger rings, bracelets, beads, and the like. Thus they spend the summer months, afterwards retiring again to the mountains for game. In the beginning of September they prepare for winter pursuits. The leaves are falling, and it is the season when the roebuck and the doe are courting. The natives avail themselves of this, and by cleverly imitating the call of the doe on a wooden horn entice the buck near enough to shoot him. Generally speaking, this is the plentiful season of the year so far as flesh is concerned; but, should the hunters not be fortunate, they live upon service berries and bilberries, which they mix with reindeer milk. They also eat the nuts of the Manchu cedar and of the dwarf-like Cembra pine. The latter part of September and the beginning of October are again employed in fishing, for the fish then ascend the river to spawn. About the middle of October begins the hunting of fur-bearing animals, the most profitable of all game, and this goes on till the end of the year.¹

Speaking of the town of Leh in Kashmir as a center and exhibition ground of travel and traffic, Mrs. Bishop says that great caravans en route for Khotan, Yarkand, and Chinese Tibet arrived daily from Kashmir, Panjab, and Afghanistan and stacked their goods in the place; the Lhasa traders opened shops for sale of brick tea and implements of worship; merchants from Annitsar, Cabul, Bokhara, and Yarkand opened bales of costly goods; mules, asses, horses, and yaks kicked and squealed and bellowed. There were mendicant monks, Indian fakirs, Moslem dervishes, Mecca pilgrims, itinerant musicians, and Buddhist

¹ Lansdell, "Through Siberia," Boston, 1882, pp. 509-510.

ballad howlers. Women with creels on their backs brought in lucerne. Ladakhis, Baltis, and Lahulis tended the beasts. Lhasa traders exchanged tea for Nubra and Baltistan dried apricots, Kashmir saffron, and rich stuffs from India. Yarkand merchants on big horses of Turkestan offer hemp for smoking in exchange for Russian stuff.¹

Speaking of globe trotting, Vambery says: "We must mention the slender thread of correspondence maintained by single pilgrims or beggars from the most hidden parts of Turkestan with the remotest parts of Asia. Nothing is more interesting than these vagabonds, who leave their native nests without a farthing in their pockets to journey for thousands of miles in countries of which they previously hardly know the names, and among natives entirely different from their own in physiognomy, laws, and customs."²

For each one of these movements there is a center about which the activity revolves. At first it is a purely natural or supply center. Such a state of life could not long exist, so artificial centers take the place of natural ones. A spring of water and not the hunting or fishing ground attracts the group. In higher life the civic center is the climax of this process.

In the industrial world, as a whole, there are centers of supply or natural material regions and areas. These come to be, as every one knows, social centers of manufacture, of exchange, and even of consuming and enjoying. Transportation centers, distributing centers, cross-road centers of social structure and activity have always existed also. Now these civic centers grow more and more to be a reality, until the modern city has six zones, not circular in their outline but having social and economical boundaries, namely:

(1) The central nucleus or governing place and regulative body. The city hall, the citadel, the capitol, conveys the idea.

(2) The busy mart, where going is the duty. In point of fact everything is in motion there.

(3) The homes of the industrious, the thrifty, the well to do—in short, the residence zone. There is more travel there and going to and fro about it than one might first suspect.

(4) The slums, the aftermath of savagery, where a portion of society goes to seed, to ruin.

(5) The garden zone, where the waste of the city and proximity to market makes it possible to get the best soil effects with least effort and greatest profits.

(6) The farmer zone, in fact a zone of thrift, and outside of that a zone of unthrift, from which all natural supply, fertility, and resources are gradually exhausted and carried to the industrial center to be used up, and little or nothing comes back to it. It is as though the soil had moved into town and left away out on the confines a broad ring of no

¹ "Among the Tibetans," Chicago, 1894, p. 60.

² "Travel in Central Asia," New York, 1865, p. 459.

man's land. This is what every eye gazes on at each moment of the day. All moving feet and beasts, trains, and boats are engaged in constructing one of these civic rings. The small centers are only like our little group; the large centers, like London or New York, are world-embracing. They rule the world, their trade is with all mankind, their good people are cosmopolitan, their vices are those of the whole race from the birth of time; hundreds of smaller civic centers minister to them and are enriched by them, and the four corners of the earth concentrate their productions there.

The map of the world has undergone wonderful changes in this regard in historic times in the location of these centers of commercial circulation, and the kind of roads that radiate therefrom, as well as in the character of the forces and vehicles involved. It would be an absorbing study for one to trace these centers, and to note the changes in roads and vehicles, but the subject of this paper relates entirely to the primitive centers and routes before there was a wheel conveyance on earth.

Burden bearing, in addition to this general participation in the creation of artificial industrial centers and great civic groups, has created special phases of society. Legislation has had no small trouble in regulating the laws of travel and trade, of interstate and international commerce. Citizens who go abroad and who traffic have been the occasion of no end of diplomatic correspondence and even of war. Those engaged in travel and transportation have themselves always had their rules, societies, corporations, organized service, and trades unions. Savage no less than civilized men travel and trade by route and by rule.

The carrying activity and trade are most intimately associated with slavery. It is not time yet to say that it was thus allied more than with other arts, nor that it was most confined thereto. Looking at the movements of men and women, the porters, roustabouts, coal stokers, and carriers are even now the most abject and hardest worked of servants. The women and captives in America did the carrying as the peons do now. In Africa the backs of slaves are the vehicles of travelers and of merchandise. The southern and southeastern Asiatic is himself a beast of burden, and so has it always been.

The complete study of this topic is full of interest to the ethnologist as well as to the technologist. It has had its ethnic elaboration as well as its industrial evolution. No less does each tribe and people of the earth have its bodily structure, manufactures, art, speech, and social life than it has its own artificial conveyances and ways of getting about and carrying. To speak after the manner of the naturalists the species of such inventions are tribal, national, and racial.

One can hardly fail to discover in a study of this sort how much its phases enter into the æsthetic arts and pleasures of mankind. Going for the sake of going, sailing in unknown waters, visiting new lands

and gazing on new skies are now and always have been ruling motives in the wills of men. The landscape gardener constructs his varied effects about meandering roads and paths; the most stirring and costly music is martial; moving scenes of men and beasts and stately ships cover the painter's canvas and sculptor's slab; we ransack the earth for a new perfume or delicious fruit. Finally, mythology and the stories of all mysterious beings begin and end with recounting their works and travels. The sky is full of paths and trails. Charon's boat bears the souls of men abroad. The obsequies of the dead are a preparation for journeying barefooted. Atlas uplifts the world ever on his broad neck and back. The Caryatides are the apotheosis of all patient women porters.

An American example of Atlas type is the stone chair of Guayaquil (fig. 3). A man on all fours supports a curved seat on his back. The whole is cut from a single block of stone.¹

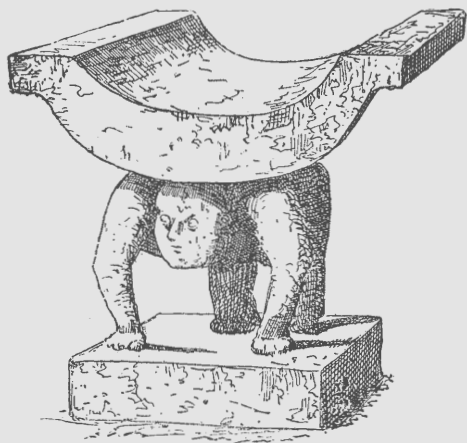


Fig. 3.

CHAIR OF SANDSTONE FROM GUAYAQUIL, PERU.

From a figure in Wiener's "Pérou et Bolivie."

In Polynesian phrase: "As I hope to escape perdition, Whakatauroa is the basket wherein rests the pillar of the earth. Its strap is Rangiwhakaoka." This saying is applied to the world. Its meaning is: If the basket had not been placed as a support for the pillar, the earth would have moved to and fro over the surface of the waters, and would have sunk therein; there would have been no resting place for the being called man, or anything else, or for anything which lives. When the overwhelming earthquake comes, the pillar is there in the basket; however great the quaking, the pillar is firm. By means of the head strap the basket is able to carry the pillar; were it not for that, the end would not be attained. There are, however, other uses of the strap as well.²

The activities here treated embrace all that may be included in the word "locomotion," or essentially all traveling, carrying, or being carried. The words traveler, freight, and passenger make the group of industries sufficiently plain. All human inventions begin with natural objects little modified, so the locomotive activities have their rise in merely going or carrying and being carried without inter-

¹ Wiener, "Pérou et Bolivie," Paris, pp. 522-523.

² Hare Hongi, "Contest between Fire and Water." Journ. Polynesian Soc., III, No. 3, p. 156.

mediate apparatus. Furthermore, while the aboriginal mineralogist, botanist, and zoologist wander about at random and do not care ever to repeat the trail, this desultory and trackless wandering soon gives place to efforts to go over the same journey even upon the water. The uses of hands and head and shoulders, and especially the feet, for journeying and transporting, and all the inventions for making these convenient and cooperative, together with the fixing and preparing of ways to facilitate them, united constitute the industry of travel and transportation.

This subject naturally divides itself into land travel and water travel. But these two can not always be separated. In the present paper, however, attention will be given to the former, which may be thus classified:

(1) Going afoot, including the study of special costumes and appliances occasioned thereby.

(2) Man as a carrier and in drawing loads. This chapter will treat of the two aspects of carrying, namely, riding and freighting, and will consider the beginnings of harness, as applied to the human body.

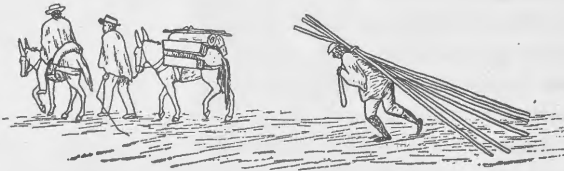


Fig. 4.

MEN RIDING, LEADING, AND DRAGGING.

From a figure in Whymper's "Great Andes of the Equator."

(3) The domestication of animals for riding beasts, packing beasts, and for traction.

(4) The origin of the road, of trails, routes, conveniences on the road, foot bridges and the beginnings of engineering.

(5) Subsidiary activities, signals, food, time keeping, receptacles, trade, stimulants, slavery.

This study will be chiefly from an objective point of view, and will be largely based on the collections in the U. S. National Museum and such other material as may be helpful thereto.

Whymper gives a little figure which in a small space comprehends all that is included in this paper (fig. 4). In the rear, as he should be, is a man painfully bearing and dragging a number of poles—burden and draft beast in one. His load is a sled without snow, a cart without wheels, a travois in which the man is the dog. Ahead of him a man is walking and leading a pack mule. This is a step higher in culture; in the epoch of domestication and breeding. In the man's hand is a whip, which bears the same relation to the firebrand that industrialism does to militancy. In front a man, possibly Mr. Whymper, rides on a mule, representing the highest grade in culture of the era of biological force, of the hand and beast.¹

¹Whymper, "Great Andes of the Equator," New York, 1892, Scribner's Sons, p. 19.

TRAVELING ON FOOT.

In the exercise of the function of traveler, men use their inventive powers to render their traveling structures more effective in going faster, in going farther, in going to places inaccessible to them in a state of nature, in going in groups, and with greater ease and comfort, and in going for longer periods. One of the elements of progressive culture is the multiplication of the necessities of travel.

Bush says of the Giliaks, "We could not make them understand that all our supplies would be required for the journey, as they carry little while traveling."¹

The first consideration in this study of man as a traveler and a burden bearer is his body as an instrument or apparatus to this end. Structurally this investigation includes—

- (1) The skeleton, its versatility and strength.
- (2) The muscular system.
- (3) The vital parts in reference to these.

Functionally the student would have to regard the activities of—

- (1) Walking, running, swimming, diving, etc.
- (2) Lifting and carrying.
- (3) Pulling and hauling.
- (4) Pushing and forcing.

In the case of migratory birds and fishes, the habit is explained by saying that they have endowments of locomotion that fit and impel them to be going. In harmony with this instinct of going, this irresistible attraction, are the exigencies of desire and supply. The environment without and the nature within conspire.

It is reasonable to suppose that in the conduct of men, the actual possession of the whole earth, their capabilities, attributes, wants, inherited proclivities are coupled with structure specially adapted to the conduct. When the cosmopolitan structure of man is considered, the domination of the earth is the legitimate functioning of his wonderful organism.²

Professor Munro has said that, as the quadrupedal animals became more highly differentiated, it followed that the limbs became also modified, so as to make them suitable not only for locomotion in various circumstances, but also useful to the animal economy in other ways, as swimming, flying, climbing, grasping, etc. But no animal, with the exception of man, has ever succeeded in divesting the fore limbs altogether of their primary function.³ What a profound fact is this in the industry here considered, both in getting about and carrying at the same time. The erect position provides the diversified requisites for the versatile walker and burden bearer in one person. Indeed, it may be said that the erect position was effected by and through the carrying art.

¹ "Reindeer, Dogs, and Snowshoes," New York, 1871, p. 125.

² Cf. Baker, "The Ascent of Man," *American Anthropologist*, Oct., 1890.

³ Cf. Rep. Brit. Assoc., Nottingham, 1893, p. 886.

(1) In the very act of progressing and supporting a load the erect position achieves the maximum of result with the minimum of effort.

(2) The fore limbs are set free from walking, climbing, flying, swimming, and all sorts of leg work, so that they may have all their time to lift and carry, to push and pull, to move themselves and objects in directions innumerable.

(3) The freeing of the fore limbs has thus been accompanied by such structural modification of them that they may hold on, balance, grasp, a handle or rope, put a burden on the head, or shoulder (fig. 5) or back, hold it in place, act singly and independently at diametrically opposite functions, or cooperate in a diversity of actions to produce and vary motion or overcome resistance.

(4) The erect position and the modifications of structure involved make it possible for so feeble a creature as man to bear great loads on the head, shoulders, back of the neck, hips, knees, breast, and arms,

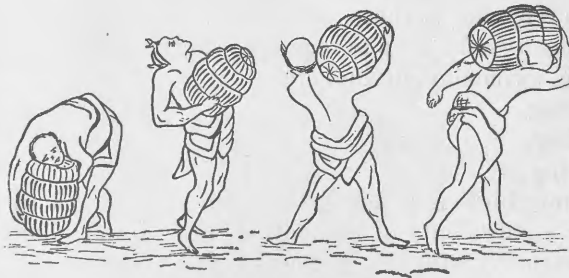


Fig. 5.

JAPANESE MAN SHOULDERING A PACKAGE OF RICE.

from a picture in the U. S. National Museum

and to vary their position while himself in motion. Upon this point Professor Munro says that everybody knows how much labor can be saved by attention to the mere mechanical principles involved in their execution. In carrying a heavy load the

great object is to adjust it so that its center of gravity may come as nearly as possible to the vertical axis of the body, as otherwise force is wasted in keeping the mass in equilibrium. The continued maintenance of this unique position necessitated the turning of an ordinary quadruped a quarter of a circle in the vertical plane to render the spine perpendicular or in line with the posterior limbs. The osseous walls of the pelvis were modified to take the additional strain. Special groups of muscles gave stability to the trunk and conferred upon the body its freedom and grace.

The lower limbs were placed wide apart at the pelvis; thigh and leg bones were lengthened and strengthened; the spinal column took on special curves; the skull was moved backward until it became nearly equipoised on the top of the vertebral column. The upper limbs became flail-like appendages, the shoulder blades receded to the posterior aspect of the trunk, having their axes at right angles to that of the spine. Further, like the haunch bones, they underwent certain modifications to afford points of attachment to the muscles required in the complex movements of the arms. The elbow joint became capable of movements of

complete extension, flexion, pronation, supination, in which respects the upper limbs of man are differentiated from those of all other vertebrates.¹

In his sinew-backed bow, made of driftwood and sinew cord, the Eskimo ingeniously converts a breaking strain of the fragile wood into a columnar strain thereon, wherein it is strongest and a tensile strain upon the sinew wherein it also is strongest. The erect position and the possibility of resting a load on vertical bones in a great variety of positions enables the carrier to get the greatest lifting result with the least danger to the body. So far this change to the erect position, with all that it implies, is just as serviceable to the exploitive, manufacturing, and consuming activities as with those that are here studied.

There is no end of encomium upon the human hand, and it does a great deal in lifting and carrying, but the especial organ of the travel and transportation industry is the foot.²

Upon this useful organ Dr. Munro may again be allowed to speak. It is in the distal extremity of the limbs that the most remarkable anatomical changes have to be noted. The foot is virtually a tripod, the heel and the ball of the great toe being the terminal ends of an arch, while the four outer digital columns group themselves together to form the third or steadying point. The three osseous prominences that form this tripod are each covered with a soft elastic pad, facilitating progression and acting as a buffer. Progression is performed by an enormously developed group of muscles, known as the calf of the leg. The walker is thereby enabled to use the heel and the ball of the great toe as successive fulcrums from which the forward spring is made, the action being greatly facilitated by that of the trunk muscles in simultaneously bending the body forward. The foot is thus a pillar for supporting the weight of the body and a lever for mechanically impelling it forward. Man possesses, moreover, the power to perform a variety of quick movements and to assume endless attitudes and positions. He can readily balance his body on one or both legs, can turn on his heels as if they were pivots, and can prostrate himself comfortably in a prone or a supine position. As the center of gravity of the whole body is nearly in line with the spinal axis, stable equilibrium is easily maintained by the lumbar muscles. This combination of structures and functions places man in a category by himself, and yet preserves the homologies common to all the vertebrates.³

The enormous multiplication of motions and methods of resistance, combining in one human body every variety of work ever done by animals, finds a correspondence in the increased size and complexity of

¹Cf. R. Munro, Rep. Brit. Assoc., 1893, p. 887, for an elaborate treatment of this subject.

²Cf. J. Cross, "On the Mechanics and Motions of the Human Foot and Leg," Glasgow, 1819, and J. C. Plumer, "The Mechanical Affections of the Human Foot," Portland, 1860.

³Cf. R. Munro, Rep. Brit. Assoc., 1893, pp. 885-895.

brain and nervous tissue—the multiplication of nerve cells. It is vain to speculate upon the priority of development in the brain or in the body as a versatile instrument of locomotion and work. Wherever the remains of man have been found the characteristics of locomotion, of the erect position necessary to human work, are stamped thereon. Man, then, the carrying animal, the beast of burden par excellence, the master of all other burden bearers in the world, is the groundwork and support of the entire carrying industry.

Jeremiah Heald, in speaking of the mechanical principles of invention actually existing in the body of man and referring to some involving the carrying art, says that the human foot contains instances of the first and second and the fore arm of the third order of lever. The patella is part of a pulley; there are hinges and ball-and-socket joints with lubricating arrangements; lungs are bellows, and the heart is a combination of force pumps; the wrist, ankle, and spinal vertebræ form universal joints; the nerves form a complete telegraph system with up-and-down lines and a central exchange; the circulation of blood is a double line of canals, in which the liquid and the boats move together, making the circuit twice a minute, distributing supplies wherever required, and taking up return loads without stopping; it is also a heat-distributing apparatus, establishing a general average, as engineers endeavor to do in building.¹

Physiologists, in speaking of the functioning of the brain, sometimes overlook these wonderful facilities for blood supply and removal. Compared with the smooth brain of the lower vertebrates, the brain of man is as New York City of to-day with Manhattan Island of the sixteenth century.

With accessories to his body, without aid of beast or physical power, man far outstrips all animal rivals. A skater at Haarlem, in Holland, went 3.1 miles at the rate of 21 miles per hour. One mile has been cycled in 1 minute, 54 seconds, and 900 miles have been made at 12.43 miles per hour, while Count Starhemberg's ride on horseback averaged only 5.45 miles per hour, and the horse died from the effort. The modern railroad is virtually a surrender of man's legs to his brains and the harnessing of physical force.²

Under exceptional circumstances man has accomplished in walking matches over 8 miles in one hour, and an average of $2\frac{3}{4}$ miles per hour for one hundred and forty-one hours. In running he has covered about $11\frac{1}{2}$ miles in an hour. In water he has proved himself capable of swimming 100 yards at the rate of 3 miles per hour, and 22 miles at rather over 1 mile per hour, and he has remained under water $4\frac{1}{2}$ minutes. He can easily climb the most rugged mountain path and descend the same. He can swarm up a bare pole or a rope, and when trained

¹Cf. Rep. Brit. Assoc., 1893, p. 862.

²Ibid., p. 864. Locomotion in both air and water are also specially considered.

can perform most wonderful feats of strength and agility. He has shown himself able to jump as high as 6 feet $2\frac{3}{4}$ inches from the ground, and over a horizontal distance of 23 feet 3 inches; and he has thrown a cricket ball $382\frac{1}{2}$ feet.

The attitude and action of a man in throwing a stone or a cricket ball, where he exerts a considerable force at several feet from the ground, to which the reaction has to be transmitted and to which he is in no way fastened, are unequalled in any artificial machine. The similar but contrary action of pulling a rope horizontally, as in tug-of-war competitions, is equally remarkable. The living mechanism, although fitted for an external atmospheric pressure of about 15 pounds per square inch, has been able to ascend to a height of 7 miles and breathe air at a pressure of $3\frac{1}{2}$ pounds per square inch. Divers have been down in the water 80 feet deep, entailing an extra pressure of 36 pounds per square inch.

Fasting operations are not less remarkable when we are comparing the human body as a piece of mechanism with those of artificial construction. For what artificial motor could continue its functions forty days and nights without fuel; or, if the material of which it was constructed were gradually consumed to maintain the flow of energy, could afterwards build itself up again to its original substance?

The marvel is not that the human bodily mechanism is capable of any one kind of action, but that in its various developments it can do all or any of them, and also carry a mind endowed with far wider powers than those of any other animal.

No animal burrows into the earth a greater depth than 8 feet, and then only in dry ground. By aid of the steam engine for pumping, for air compressing, ventilating, hauling, rock boring, electric lighting, etc., and by the utilization of explosives man has obtained complete mastery over the crust of the earth and its mineral contents down to the depths where, owing to the increase of temperature, the conditions of existence become difficult to maintain.¹

As will appear, the physical man as a traveler and carrier takes on special ethnic peculiarities in this regard. The races of men do not walk alike, have not the same endurance in going, do not use the same part of the body in carrying and in locomotion artificially effected.

Now many of these differences are not racial, but physiographic. The burdens to be carried and the resistances to be overcome are different. There are varieties of elevation, climate, exposure, salubrity which modify the body. The apparatuses of riding and of burden bearing also have to conform to the nature of things. So we not only have types of burden bearers, but types of burden bearing and of burden utensils. The American aborigines were chief of the races in this regard. They had no riding beast and were compelled to walk.

¹ Cf. Harley, "On the Recuperative Bodily Power of Man," *Journ. Anthropol. Inst.*, London, 1887, xvii, pp. 108-118.

Their helpful animals were the dog in the north and llama in the Andes; otherwise men and women had to work in traces and under great loads. The network of inland streams in both Americas developed also the boatman class.

The Africans of negro type, south of the Sahara, were also their own beasts of burden. Wherever the burden camel or ass appears it is a Hamitic introduction. In the chapter on burden bearing the special types of carrying will be shown. Carrying on the head, or toting, with the anatomical peculiarities that this implies, is common with the nappy haired tribes. The exigencies of food getting, of slave capture, of long reaches of uninhabitable country, of war made of the African a great walker and wanderer. This is manifest in the condition of the language problem.

The Polynesian is a boatman, a swimmer, and makes few foot journeys of any length. His carrying muscles are not developed and his rounded form is not suggestive of Atlas or Hercules. His paddling muscles are splendidly emphasized, and his agility with his hands is surprising. He has been the greatest of modern aboriginal travelers; the short distances that he could make afoot acting as an efficient impulse to the invention of seaworthy craft.

His cousin, the Malay, lives on larger islands, and, having no domestic animal, must necessarily be a more wiry pedestrain, a better carrier and pack animal. Indeed, there are two kinds of him, land Dyak and sea Dyak, physically different as any one would suppose. The land Dyak is a walker, and is on his feet constantly. Books of travel invariably represent him barefooted, with a long staff or spear and bearing on his back a load supported by a head band.

The Sinitic group are in the South great watermen, have only a little to do with cattle, much for elephants to do, and hence are not addicted to carrying as the Chinese are. But the Celestials and the Japanese have marvelous backs. Later on the Chinese carrying trade and methods shall be reviewed, but here let it suffice to say that the physical endowments of the Chinese coolie are not surpassed. China is in the hand and back epoch of culture. Pack beasts are common enough, but they do not enter into competition with the legitimate burden bearers.

The Hamito-Semitic stock have taken to riding and to pack beasts and are not specially modified in body for beasts of burden. Layard long ago said that the Arab has no wheelbarrow muscle, and he might have added that his muscles for a long walk are likewise defective. India is somewhat like farther India. The aboriginal peoples are largely water folk.

The long Piedmont of northern Asia is the home and special training ground of most of the beasts of burden—dog, reindeer, camel, horse, ass, ox. Upon these the people lay their loads or exact the duty of dragging their vehicles. Walkers are not rare, but profes-

sional carriers are so. It is not, therefore, to be expected that the bodies of the people should have been specially changed. In this region, however, the process of domestication is in its infancy, and under such circumstances always man has more than half of the walking and working to do.

Within the areas called civilized, where local movements give place to world movements, all ancient forms of going and carrying survive and the active pursuit of them becomes professional. Roustabouts and porters are there a class. Their backs, limbs, and whole anatomy are greatly modified by their trade.

Vambery mentions in his company from Teheran one Hadji Kurban, a peasant by birth, who as a knife grinder had traversed the whole of Asia, had been as far as Constantinople and Mecca, had visited on occasions Tibet and Calcutta, and twice the Khirghiz Steppes to Orenburg and Tagaarog.¹

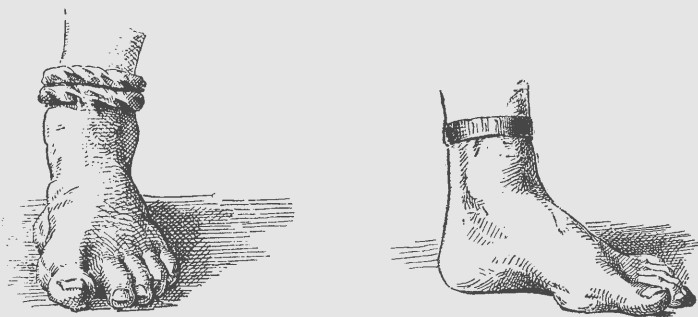


Fig. 6.

PERUVIAN ANKLE BANDS FOR TRAVELERS

From a figure in Wiener's "Pérou et Bolivie."

Bodily deformations result from the carrying art. Commencing with the cradle, the back of the heads of American Indian infants are said to be compressed by contact with the hard papoose frame in which they are carried. "Flattened or platynemic tibias have often been mentioned as a pithecoïd reversion and also as a racial trait. They are neither. Virchow has abundantly shown that they are produced in any race by the prolonged use of certain muscles, either in constant trotting, in prolonged squatting, in carrying burdens, or in the use of peculiar foot gear. The proof that it is acquired is that it is never found in the tibias of young children."²

The custom of belting the body and bandaging the legs (fig. 6) found so common in tropical America may have had its origin in the exigencies of travel or going about. Among the ignorant laborers in America,

¹"Travels in Central Asia," New York, 1865, p. 42.

Brinton, *Am. Anthropologist*, Washington, 1894, p. 381. quoting Dr. Matthews, *Mem. Nat. Acad. Sci.*, VI, p. 224.

especially among the negroes in the South, the opinion prevails that a strip of eel skin about the leg has a beneficial effect in preventing rheumatism, cramp, sprains, and the like. That this belief has a wide dispersion may be supposed from the frequency of bands about the ankles noted among primitive peoples. The ancient Peruvians wore about the ankle bands of metal, cord, or textile.

With relation to the elements in which man travels the species may be said to be terrestrial, aquatic, and semiaerial. Because he not only progresses on the ground, but moves freely in and under the water naturally and by his inventions, he also climbs into the air naturally on trees, and by his machinery ascends above the flight of any bird.

SPECIAL COSTUME FOR TRAVEL.

The special costume for going away from home became more and more differentiated with the extent of a journey of a day, with the annual circle of activities, with the sphere of trade and influence, and with the knowledge of those ever-widening currents of acquaintance and intercourse which quickened the pace and lengthened the excursions of travel. All these were extremely limited at first, as they are now limited among rustic and other folk, and consequently the traveling clothing little differed from that worn at home. The outfit of the primitive traveler, though not to be compared with that of his modern representative, was devised to meet his wants. It would include: (1) Special costume for the body; (2) special protection for the head; (3) protection for the eyes; (4) foot gear; (5) snowshoes; (6) creepers for walking on ice; (7) stilts and other elevating devices; (8) staff and scrip; (9) climbing devices. In this connection should be considered runners and couriers of various kinds.

Costumes of most useful patterns were invented for those who go away from home. It has often been asserted that men and women adorned their bodies before they clothed them. As regards clothing for the sake of clothing this may be true. But those who had to go away far from the accustomed shelter must need to take temporary shelter with them, and that is clothing. This useful apparatus must not be confounded with that artistic and ceremonial toggery which in association with tattooing, cosmetics, and artificial deformation constitutes the costume of staying at home and is never seen on the road. Traveling costume was devised and perfected as culture widened. In the tropics, prior to the art of plaiting blankets or mats and weaving cloth, nature's textile, or bark cloth, was in vogue. The Africans used a very crude variety of this fabric, and in tropical America similar cloth is employed both for travelers' clothing and for the attachment of ornaments. The Polynesians were most expert in beating from the inner bark of certain trees a tough fabric which was protective and easily removed.

In addition to the bark cloth, in all three tropical areas, specially good mat makers may be found.

The aborigines of the three areas^{*} also carried the notion of the personal journeying roof to the extent of inventing rain cloaks and umbrellas, which are no more than thatches to cover one man. The U. S. National Museum possesses examples from Japan and middle or Latin America.¹

The temperate zone man found himself the possessor of a few textiles and used them economically in clothing, hemp, flax, cedar bark, cotton, and jute. But his land abounded in ruminants, whose dressed hides and whose hair enabled him to house his body for any journey. In America the tawed hides of buffalo, moose, caribou, deer, elk, and the pelts of buffalo, bear, and a great variety of carnivores and rodents were more than sufficient for the exigencies.²

The going away from home was by both men and women, and therefore the temperate region aborigines of North America were the best clad savages in the world. This is especially true of the hunter tribes, while the agricultural eastern tribes are represented by the old artists as quite devoid of clothing. The fragile and movable tents of the Plains Indians were supplemented by better garments more constantly worn.

The buckskin, fur, and woven fur clothing in America reaches from Mexico to the Eskimo border. In the corresponding area of Europe in earliest historic times similar dress was worn by the primitive Aryan tribes. It may be that the Piedmont hordes of northern Asia were once so arrayed, but since the earliest records garments of wool woven and felted have been in vogue. Quite frequently the pelts of lambs and other domestic animals constitute a survival from an earlier period.

The elevated regions of South America demand of the traveler artificial clothing and furnish him one of the best substances in the hair and the skins of the Auchenias. The spindle is a common object in all Peruvian collections, and all mummies are comfortably clad for their long journey.³

The Africans are good spinners and weavers of cotton and of palm fiber. For this operation they use looms only a few inches wide and sew together several widths of cloth, which they wrap around their bodies not only as a protection from the elements, but in its folds they carry both children and merchandise.

The coolies, in south China, usually have on nothing but a pair of loose trousers, tucked up above the knees. They have jackets, but rarely wear them while on the road. They have the body above the loins naked while at work just as men here go in their shirt sleeves. A straw hat and a pair of trousers or simple loin cloth is all the clothing most of them wear throughout the year. In the winter they put on thick jackets. This is on the testimony of Dr. R. N. Graves, for many years a missionary in China.

¹ Illustrated in the "Capitals of South America," by W. E. Curtis.

² Mason, "Aboriginal Skin Dressing." Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1889 (1891), p. 553.

³ Wiener, "Pérou et Bolivie."

The traveling Chinaman and Japanese thatch the head and the body against the rain with broad hats and abundant rain cloaks, as will be specially shown further on.

These two countries furnish the best examples of highest achievement in the industrial epoch of the hand. More men are professionally carrying burdens, the distances between artificial culture centers are longer, the tonnage carried on backs of human beings is vaster, and the outfit of the carrier is more differentiated.

The hyperborean man and woman go almost as naked in their hut or underground house as their congeners farther south. It is when they venture forth that they exhibit the highest invention in dress. It is possible though risky, for tropical or temperate region man to defy the elements, but the hyperborean man can not for one moment. So he constructs an air-tight nonconducting house of skin, whether of reindeer, bear, hair seal, bird, or marten. Herein he is as safe as in his home.

Omitting the inquiry how so many stocks of mankind, from North Cape to east Greenland came to be dressed substantially alike, it is true that they are dressed so harmoniously to the environment that the white man when he goes to live among them simply has to don their garb with few modifications.¹

The body clothing of the Kamchatkan traveler includes: (1) The kuklander, long tunic of deerskin, double, reaching to the knees, with hood; (2) torbossas, long fur boots with fur socks inside; (3) malachis, fur bonnet or nightcap worn inside the hood; (4) archaniles, long tippets held in the teeth to protect the face. These with mittens and deerskin trousers complete the costume.²

Bush, at Ghijigha, speaks of his sleeping dress as follows: "My robe de nuit consisted of an immense fur kuklander of double thickness and extending to my ankles; a heavy spacious hood covered the head and was bordered with a thick fringe of wolf hair to keep the drifting snow out of my face while sleeping; fur sleeping socks, one of which was as large as a small-sized barrel. All else needed to complete my comfort was to throw my bearskin on the soft snow for a mattress."³

Among barbarous and semicivilized peoples travelers note some special form or attribute of dress, perhaps inexplicable at first but easily explained when the environment is known. The Yuma Indians put mud on their bodies at night or in the morning to keep out the chill, but as the sun advances it wears off and leaves the body naked. The Latin Americans and all other Latin peoples don the poncho, which may be now a shawl, now a rain protector, or it may be doubled

¹ On the making of the Eskimo garment, see Murdoch, Ninth Ann. Rep. Bureau of Ethnology.

² Bush, "Reindeer, Dogs, and Snowshoes," New York, 1871, p. 61.

³ Ibid., p. 361.

up and carried against an emergency. The Semito-Hamitic girdle or sash, that may on occasion become a shawl, belongs to this general utility garment. The light shawl on the arm of the opera goer or evening visitor is a survival of this very old precautionary garment.

HEAD GEAR.

The second class of special costume demanded for the traveler chiefly was protection for the head. Not only is the head especially exposed and vulnerable, but it occupies an important place in the traveler's outfit. It is his watchtower from which he looks out on the track, his telegraph and telephone office into whose receiver the voices of nature whisper, his transmitter of messages to his fellows, his detective to advise and warn. The sun, the storm, the cold strike the head first and most, so aside from any idea of ornament dame nature has given to the negroid and other tropical peoples and to Arctic peoples an abundance of hair. The skin of the head has a remarkably adaptive power, suiting itself to enormous differences of temperature. But for cosmopolitan man these did not suffice, and before he had any notion of adorning his head he covered it to protect it.

Each culture region has its type of hat, each isothermal belt covers the head of the traveler conveniently. Elevation, temperature, rainfall, wind, natural materials all tell upon the head cover. There are also among travelers race hats, national hats, and guild hats. There are in the U. S. National Museum a large collection of hats from all parts of the world which enables the student to make some interesting comparisons in this regard.

Among the types of men the Australioid travel little and protect their heads less, either to keep them warm, to shade them, to shed the rain, or to defend the eyes. There is not an Australian hat in the U. S. National Museum.

In tropical Africa, both among the negroes and the Bantu, the head receives much adornment and no protection. The Africans are good braiders, however, and make excellent hats for others to wear. In America and other lands whither the African was borne as a slave, he disdains the hat and may be seen working bareheaded in the fields. But in Latin America, as is well known, the negro and the Indian united their blood and their arts to such an extent that some of the excellent hat making of that region must be accredited to the influence of the former.

The American aborigines of the tropics are divided into highlanders and lowlanders. The latter wear no hats; at least in pictures they appear unclothed as to the head, and the U. S. National Museum has no specimen. In the upland or montagnais of the tropics the Indian carriers appear constantly with skullcaps woven from paco wool. The natives that have become Latinized wear the sombrero, both of vegetable fiber and of wool.

The Polynesians or, more properly speaking, the Indo-Pacific races, Malay, Negroid, and Polynesians, go bareheaded. They are a maritime people largely, and ignore the hat as a protection in their canoe travel.

In the temperate regions there has been most land travel always and more demand for head covering, and yet there is great difference of opinion evidently as to what kind of hat to wear. The heaviest hats and turbans regardless of heat belong to the traveling races—the camel, mule, and horse riding stocks in America, in north Africa, and in western Asia as far east as the Mohammedan religions and mongoloid peoples extend.

The turban is also at home in India, and it is a perpetual wonder how in a land of so much heat the human head can stand such bundling. It is a fact that this head gear belongs to an alien and conquering race, that it now stands for caste and there is no telling what mankind are willing to suffer for pride and vanity. The native peoples of India are pictured as bareheaded. The climate renders the headdress unnecessary, and the noncaste people are not given to moving about.

As soon as one approaches the Sinitic area and the land of rattan and bamboo the turban gives place to the umbrella and the parasol and to hats akin to them. The widest and most varied head gear belongs to China, Korea, and Japan. The distinctions of rank, locality, and sect are drawn on the hat. With these, further than they are survivals from earlier industrial forms, there is nothing to do here. The traveling hat of all these regions and of farther India, so far as it is related to China, the traveler's and the Coolie's hat is an individual roof, a defense against sun and rain.

Says Bush:

I could not help admiring the taste displayed by many of these Giliaks whom we passed in the manufacture of their hats. They are made of birch bark, shaped like a low, broad cone, the outside covered with beautiful scroll-work figures cut from stained bark.¹

In the temperate regions there has been most traveling, but, aside from fur, hat material is scarce. Above the temperate, in the boreal regions, men are compelled to draw in the awnings for rain and sun shedding, to substitute a wind and cold proof material, and to encase the head in the hat to keep out the cold. In other words, the boreal man wears a hood rather than a hat.

The distribution of the hood is as follows: (1) All Eskimo, of fur, attached to parka; (2) Athapascans, of buckskin, ornamented; (3) Koraks.

¹ "Reindeer, Dogs, and Snowshoes," New York, 1871, p. 99. Compare Tlingit painted and overlaid hat, Aleut visor hats covered with carved ivory, painted bands, and figures, and east Greenland articles adorned with little figures, Albert P. Niblack, Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1888; also G. Holm, "Ethnologisk Skizze," Copenhagen, 1887, pls. xxviii-xl.

SUNPROOF AND TRAVELERS' HATS IN THE U. S. NATIONAL MUSEUM.

Museum number.	Specimen.	Locality.	By whom contributed.
5362	Hat, conical.....	China.....	J. Varden.
154249	Hat, palm leaf and rattan.....	Hoihow, China.....	Dr. Julius Neumann.
167190	Hat.....	Mongolia.....	W. W. Rockhill.
167188-167189	.....do.....	Tibet.....	Do.
167191-167193	.....do.....	.....do.....	Do.
77061	Hat, coolie's.....	Korea.....	J. B. Bernadou.
77065	.....do.....	.....do.....	Do.
60236	Hat, rain.....	Southeast Alaska.....	J. J. McLean.
73840	Hat, grass.....	Alaska.....	T. Dix Bolles, U. S. N.
16267	Hat, woven straw or plaited.....	.....do.....	W. H. Dall.
72447-72449	Hat, straw.....	.....do.....	J. J. McLean.
20884-20885	Hat, Haida Indians.....	Queen Charlotte Island.....	J. G. Swan.
670	Hat, basket.....	Northwest Coast.....	George Gibbs.
1782	Hat, native.....	.....do.....	Dr. Suckley.
2576	Hat, plaited straw.....	.....do.....	Lieut. Wilkes, U. S. N.
2577	Hat, water-tight.....	.....do.....	Do.
2581	.....do.....	.....do.....	Do.
2695	Hat, straw.....	.....do.....	Do.
2719-2722	Hat.....	.....do.....	Do.
671	Hat, basket.....	Strait of Fuca.....	George Gibbs.
1039	Hat, conical, Makah Indians.....	Neah Bay, Washington.....	J. G. Swan.

RAIN CLOAKS.

The rain cloak is a roof of thatch for the body. It is found in regions where there is much going about, much rain, and suitable material for its manufacture. In its manufacture or plan of structure will be found not only provision for turning rain from the wearer's body, but that other omnipresent thought in the minds of manufacturers which compels them to make things easy of transportation in the least compass. There is more time and cost expended in making a parasol or umbrella easy to carry than in making it sunproof or rainproof.

Museum number.	Specimen.	Locality.	By whom contributed.
447, 448	Japanese rain cloaks.....	Japan.....	Commodore Perry.
73062	Rain coat.....	North Formosa, China.....	Royal Gardens, Kew, England.
152534	Rain cloak.....	Kiungchow, China.....	Dr. Julius Neumann.
36186-36187	Waterproof shirt, intestine.....	C. East, Siberia.....	E. W. Nelson.
49101	.....do.....	C. Prince of Wales.....	Do.
43337-43338	.....do.....	Golovina Bay.....	Do.
38817	Waterproof dress, fishskin.....	Mission, Alaska.....	Do.
153733	Waterproof dress, intestine.....	St. Michaels, Alaska.....	J. H. Turner.
129816	.....do.....	.....do.....	Mrs. M. McL. Hazan.
129339	.....do.....	.....do.....	L. M. Turner.
43283	.....do.....	Nushagag, Alaska.....	E. W. Nelson.
127671	.....do.....	Fort Alexander, Alaska.....	J. W. Johnson.
127668	.....do.....	.....do.....	Do.
56083	.....do.....	Bristol Bay, Alaska.....	C. L. McKay.
55966	.....do.....	.....do.....	Do.

RAIN CLOAKS IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed
20919	Waterproof dress, intestine.....	Unalashka, Aleutian Islands.	J. G. Swan.
8943	.....do .....	.....do	A. H. Hoff, U. S. A.
68134	.....do	Hudson Bay	J. T. Brown.
10170	.....do	Igloodik.....	C. F. Hall.
74450-74451	.....do	Ungava, Canada	L. M. Turner.
36944	Waterproof cloak.....	Upernivik, Greenland ..	Governor Fenckner.
128870	Rain coat of rushes.....	Washington State	Charles Willoughby.
76930	Palm-leaf rain cloak.....	Mexico	New Orleans Exposition
126583	Rain cloak, palm leaves.....	Guadalajara, Mexico...	Dr. E. Palmer.
75954-75956	.....do	Indians of Central America.	Miles Rock.
131050	Rain cloak of feet.....	Eastern Tibet	W. W. Rockhill.

SUNSHADES AND UMBRELLAS.

The sunshade and umbrella are in effect hats. They do not exist in eastern Asia outside the bamboo area, the lightness and strength of



Fig. 7.

THE PRIMITIVE UMBRELLA IN GUATEMALA.

From a figure in "The Capitals of South America," by W. E. Curtis.

of the material inviting to their creation. In tropical America they may be an innovation (fig. 7). But in antiquity gorgeous examples are part of the traveling convenience of royal persons. In the sculptures of Egypt, Nineveh, and Persepolis umbrellas are frequently figured. In ancient Greece and Rome, in medieval Europe, they had reached the stage of art and effeminacy. Useful umbrellas were plentiful in London in the eighteenth century, and we read of common examples for coffee houses and parishes.¹

¹Cf. Gay, "Trivia," London, 1716; "Notes and Queries," London, series 5, VI, pp. 202, 313.

EAR PROTECTORS.

Museum number.	Specimen.	Locality.	By whom contributed.
175103	Ear protectors.....	Leh Ladakh.....	Dr. W. L. Abbott.
45088-45089	Face protectors, bearskin.....	Kings Island.....	E. W. Nelson.
38694	Ear flaps or protectors of fur.....	Kongig, Alaska.....	Do.
55981	Ear lapets.....	Bristol Bay, Alaska.....	Charles L. McKay.
76724	.....do.....	Fort Alexander, Alaska..	J. W. Johnson.

GLOVES AND MITTENS IN THE U. S. NATIONAL MUSEUM.

The defense of the hand is imperative in Arctic and boreal travel, hence, the glove is universal around the hyperborean region. The clothing of the hand is bound by the conditions of (1) temperature, (2) piercing wind, (3) material most handy and effectual, (4) the use to which the hand must be put on the journey of fishing, hunting, paddling, trap setting, dog driving, etc. Hence will be found the mitten with and without thumb, the glove with each finger distinct, and the glove with other dividing of the fingers. As the student moves from Eskimo to Athapascan tribes in America he passes from the fur mitten to the buckskin glove.

In an elaborative series the hand covering may be classified by material, by complexity of structure, and by function. The U. S. National Museum series divide themselves into mittens, divided mittens, and gloves. All of these may be further separated into haired and unhaired, the former into hair inside and hair outside. The gloves in the series have the fingers sewed on all around where they join the hand and are not continuous as in the modern examples. Among the Eskimos gloves are essential not only against cold, but also in handling the vicious dog.

In the Nelson collection (Nos. 1038, 5250) in the U. S. National Museum is a pair of gloves from the Kaviarigmut, south of St. Michaels. The three compartments of the left hand glove are characteristic of this region only. Unalet name, aghe 'gää́t, 'Malemut, ad the gää́t.

Museum number.	Specimen.	Locality.	By whom contributed.
129426	Gloves, knit.....	Norway.....	Mrs. E. S. Brinton.
128328	Gauntlets (one pair).....	Persia.....	Charles Heap.
73108	Gloves, antelope skin.....	Tate Yama, Japan.....	P. L. Jouy.
150688	Mittens.....	Yezo, Japan.....	Romyn Hitchcock.
1439	Mittens, Chukchi.....	N. E. Asia.....	Commodore John Rodgers.
38454	Gloves, European model.....	Bering Straits.....	E. W. Nelson.
48176, 48177	Gloves, embroidered.....	Siberia.....	Do.
153529	Mitts.....	North Siberia.....	Lient. G. B. Harber, U. S. N.
64271	Gloves, beaded.....	Point Hope, Alaska.....	E. W. Nelson.
43322	Mittens, waterproof, very long..	Golovina Bay, Alaska...	Do.
43324	Gloves, deerskin.....	.....do.....	Do.
43341	Gloves, seal pelt.....	.....do.....	Do.
43342, 43343	Mitts, two pairs, seal pelts.....	.....do.....	Do.

GLOVES AND MITTENS IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
48101	Gloves, deerskin, fine, long.....	Kings Island, Alaska...	E. W. Nelson.
48381	Mittens, waterproof.....	do.....	Do.
45084	Mittens, man's, seal skin.....	Sledge Island, Alaska...	Do.
45085	Gloves, man's, seal skin.....	do.....	Do.
45398	Mittens, man's, seal skin.....	do.....	Do.
48127	Mittens, seal skin, waterproof.....	do.....	Do.
48127	Mittens, waterproof.....	do.....	Do.
43782	Gloves, seal skin.....	Cape Nome, Alaska.....	Do.
45286	Gloves, waterproof, seal skin.....	do.....	Do.
8783	Mittens, leather.....	Kusilvak, Eskimo.....	W. H. Dall.
7584	Mittens, dogskin.....	St. Michaels.....	Do.
44350	Mittens, deerskin.....	Norton Bay, Alaska.....	Do.
572	Mittens, man's.....	Yukon River, Alaska.....	B. R. Ross.
892	Mittens.....	Yukon, Alaska.....	R. Kennicott.
7592	Gloves, winter.....	Unalakleet.....	W. H. Dall.
7593, 7594	Gloves, summer.....	do.....	Do.
7595	do.....	do.....	Do.
2017	Mittens.....	Yukon River, Alaska.....	B. R. Ross.
8781	Mittens, fishskin and seal pelt.....	do.....	W. H. Dall.
10489	Mittens, dogskin.....	do.....	J. T. Dyar.
38455	Gloves, embroidered.....	Anvik, Alaska.....	E. W. Nelson.
64280, 64287	Mittens, deerskin, fine.....	Yukon River, Alaska.....	Do.
24324	Gloves, deer pelt.....	Norton Sound.....	Do.
7600	Gloves, summer, deerskin.....	Mahlemuts, Alaska.....	W. H. Dall.
72842	Mittens, buckskin, embroidered.....	Alaska Indians.....	Ivan Petroff.
21598	Mittens.....	Alaska.....	Dr. J. B. White.
73056	Mittens, with strap to hang around the neck, ornamented with beads.	Bristol Bay, Alaska.....	C. L. McKay.
74433, 74434	Gloves, buckskin.....	Sitka, Alaska.....	J. J. McLean.
153759	Mittens.....	do.....	J. H. Turner.
127335	Mittens, fishskin.....	Bristol Bay.....	I. Applegate.
55967	Mittens, fishskin.....	Bristol Bay, Alaska.....	Charles L. McKay.
55968	Mittens, woven grass.....	do.....	Do.
55970	Mittens, fishskin.....	do.....	Do.
56066	Gloves.....	do.....	Do.
56067	Mittens.....	do.....	Do.
36207	Gloves, white fur on back.....	Bering Straits.....	E. W. Nelson.
44145	Gloves, fingers sewed in, 2 pairs.	Kotzebue Sound.....	Do.
48135	do.....	do.....	Do.
89829	Gloves, deerskin (two pairs).....	Point Barrow, Alaska.....	Lieut. P. H. Ray, U. S. N.
128398	Gloves, boy's.....	do.....	E. P. Herendeen.
128400	Gloves, infant's.....	do.....	Do.
153602	Mittens, winter.....	do.....	John Murdoch.
64289	Mittens, old, bird skin.....	Diomede Island, Alaska.....	E. W. Nelson.
90461	Mittens, fishskin.....	Igiagik River.....	William J. Fisher.
90462	Mittens, grass.....	do.....	Do.
49115	Mittens, buckskin and quill.....	Tanana River.....	E. W. Nelson.
887	Mittens, woman's.....	Lower Mackenzie River.....	R. Kennicott.
1716	Gloves, deerskin, man's.....	do.....	R. MacFarlane.
1727	Mittens, bearskin, woman's.....	Mackenzie River.....	Do.
1728	Mittens, deerskin, man's.....	do.....	Do.
5131	Mittens, bearskin.....	do.....	Do.
5132, 5133	Mittens, wolverine.....	do.....	Do.
1337	Mittens, deerskin.....	Anderson River.....	C. P. Gaudet.

GLOVES AND MITTENS IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
1338	Mitten (one), Polar bearskin.....	Anderson River.....	C. P. Gaudet.
1665	Gloves, bearskin.....	do.....	R. MacFarlane.
1668	Mittens, fox skin.....	do.....	Do.
1680, 1681	Gloves, deerskin.....	do.....	Do.
1682	Mittens, deerskin.....	do.....	Do.
1684	Mittens, fox and deer skin.....	do.....	Do.
1704	Mittens, fox skin.....	do.....	Do.
1729, 1730	Mittens, deerskin.....	do.....	Do.
2224, 2225	Gloves.....	do.....	Do.
7638	Gloves, white bearskin.....	Fort Anderson.....	Do.
7639-7641	Gloves, black and white wolverine.....	do.....	Do.
7643-7646	do.....	do.....	Do.
7647	Gloves (odd), fur-lined.....	do.....	Do.
11008	Gloves, chamois.....	Baffin Land.....	Capt. C. F. Hall.
5212	Mittens.....	Repulse Bay.....	Do.
68118	Mits, sealskin.....	Hudson Bay.....	Charles G. Osbourne.
68119	Gloves, fur.....	do.....	Do.
14254	Mittens.....	Baffin Land.....	Capt. C. F. Hall.
13137	Mittens, sealskin.....	Greenland.....	Frank Y. Commagére.
13136	Mittens, woolen.....	do.....	Do.
37546	Gloves.....	do.....	N. P. Scudder.
153519	Mittens.....	Labrador.....	Henry G. Bryant.
90071	Mittens, child's, beaded.....	do.....	L. M. Turner.
90074	Mittens, long, sealskin.....	do.....	Do.
90194, 90195	Mittens.....	do.....	Do.
90200	do.....	do.....	Do.
90355	Mittens, toy.....	do.....	Do.
74482, 74483	Gloves, skin.....	do.....	Do.
74484	Gloves, white fur.....	do.....	Do.
23741	Gloves.....	South Dakota.....	Paul Beckwith.
20794	do.....	Sitka, Alaska.....	J. G. Swan.
18911	Mittens, buckskin.....	Northwest coast.....	Do.
131245	Gloves, embroidered, Colvilles.....	do.....	Dr. Geo. M. Kober, U. S. A.
12080	Mittens, Pai Ute Indians.....	Southern Utah.....	Maj. J. W. Powell.
14629	Mittens, fur, Pai Ute Indians.....	do.....	Do.
14634	do.....	do.....	Do.

TRAVELERS' STAVES.

The traveler is usually seen with some sort of stick or staff in his hand. This series of utensils find their artistic culmination in the modern costly cane and in many beautiful uses of the word in poetry. The magic staff and the crozier connect this class of objects with mythology, folklore, and ecclesiasticism. The uses of the walking stick are as follows: For staff on which to lean and as a weapon; the walking stick, in the hand of all carriers; climbing stick, or alpenstock; rest for load, often forked; steering for skees, frequently shod; help in rising, as among the Papago, etc.; protection, culminating in the crozier.

The frequency of the staff in the hands of Assyrian kings, shown on the ancient monuments, recalls the days when it was a necessity to every pedestrian, not only for support but for defense.

The staff of the Norwegian skee rider is a mere balancing pole, which may, and probably does, come by and by to be the alpenstock. Nansen, in his excellent chapter on the skee, to be noted further on, condemns the staff for the professional skee rider, and shows how the best prize riding is done without it. Practically, however, while on his journey across the inland ice, he is never seen without one in his hand.

The indispensable accompaniment of the Indian and rude peoples on snowshoes is the pole or staff. It exists in two forms, the shod and the unshod. At the bottom of the shod staff a little wheel about 6 inches in diameter is made of wood in Norway, but in Finland or northeastern Asia or in Alaska the wheel is a hoop of bone with four or more spokes of rawhide. Doubtless the snowshoe staff is of recent Asiatic introduction.

The snowshoe staff of the Lapps, Finns, and Norwegians (fig. 8) is a pole 8 feet or more long, shod at the bottom with a strip of antler or bone. A very few inches above this point or spud is a hoop about 6 inches in diameter, attached to the staff at right



Fig. 9.

THE SNOWSHOER'S STAFF
OF THE GILIAK.

From a figure in Schrenk's "Reisen
und Forschungen im Amur-
Lande."

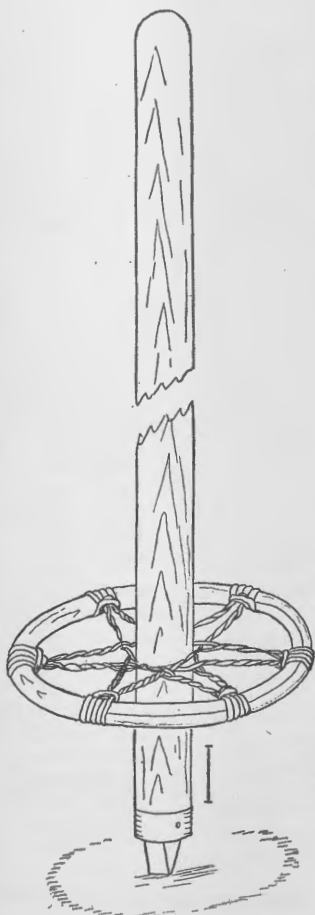


Fig. 8.

FINLAND SKEE STAFF WITH SNOWSHOE
AT THE BOTTOM.

Cat. No. 167889, U. S. N. M. Collected by John M.
Crawford.

angles by rawhide strings radiating and forming a kind of snowshoe. Precisely this form is to be seen in Alaska but the Giliaks on the Amur attach a paddle to the upper end of the staff¹ (fig. 9).

At Oudskoi, on the Okhotsk Sea, Bush figures natives on skees carrying in hand the pole with a little wheel stop near the bottom.²

¹Schrenk, "Reisen und Forschungen im Amur-Lande," St. Petersburg, 1891, K. akad. Wissensch., III, p. 476.

²"Reindeer, Dogs, and Snowshoes," New York, 1871, p. 194.

Hooper speaks of a "long, thin staff of driftwood, shod at the foot with pointed ivory or seal's tooth, and furnished with a circular frame, generally of whalebone, sometimes 6 or 8 inches in diameter, attached to it 3 or 4 inches above the shoe; this frame is covered with a net work of hide cord, and its use is intended to prevent the staff going deep in the snow and so tripping him whose support it should be. It is a valuable acquisition, particularly with snowshoes"¹ (fig. 10). There are in the U. S. National Museum examples from Finland, western Alaska, and Schrenk figures them from the Amur country.²

The only staff used by the young and vigorous at Point Barrow, according to Murdoch, is the shaft of the spear, when one is carried. The aged and feeble, however, support their steps with one or two staves about 5 feet long, often shod with bone or ivory. (The old man whom Franklin met on the Coppermine River walked with the help of two sticks.)³

The walking stick of the Carrier Indian of British Columbia, which he uses in winter, is precisely like that seen in the hands of the hyperboreans, with a little circular snowshoe fastened about the stock near the bottom. The Indian makes a novel use of his staff. Having a leather loop like the guard of a sword fastened at the top, he puts his left hand through it and lays his gun barrel on his hand for a rest. Father Morice figures a carrier kneeling and shooting with his gun thus sustained.⁴

"Sometimes a man shall meet a lame man or an old Man with a Staffe; but generally a staff is a rare sight in the hand of the eldest, their Constitution is so strong. I have upon occasion travelled many a score, yea many a hundred mile amongst them without need of stick or staffe, for an appearance of danger amongst them."⁵

Many of the market people (of Ayacucho) come on foot from considerable distances, the women carrying their babies on their backs in bundles called *cepi*, and the young men using a walking stick for support in passing up and down the wearisome ravines.⁶

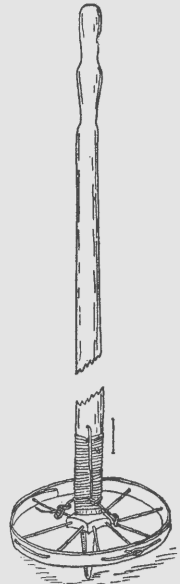


Fig. 10.

SNOWSHOE'S STAFF OF THE
CAPE NOME ESKIMO.

Cat. No. 45423, U. S. N. M. Collected by
E. W. Nelson.

¹"Tents of the Tuski," London, 1853, Murray, p. 147.

²"Reisen und Forschungen im Amur-Lande," p. 476.

³Murdoch, Ninth Ann. Rep. Bureau of Ethnology, p. 352, quoting Franklin, "First Expedition," II, p. 180.

⁴Trans. Canadian Inst., 1894, IV, 155, figs. 144, 145.

⁵See Coll. R. I. Hist. Soc., I, p. 76, for paper by Roger Williams, "Key into the language of the Indians of New England."

⁶Markham, "Journey to Cuzco," London, 1856, p. 64.

TRAVELERS' STAVES IN THE U. S. NATIONAL MUSEUM.

Museum number.	Specimen.	Locality.	By whom contributed.
167889, 167890	Skee staves	Finland	Hon. J. W. Crawford.
45423-45425	Staves used for supporting travelers on ice.	Cape Nome, Alaska	E. W. Nelson.
46297	Bottom of snow cane.....	Alaska.....	W. H. Dall.
14953	Staff	Aleutian Islands.....	W. H. Dall.
151695	Staff with knob, Kaffirs.....	Africa	British Museum.
165348	Cane, walking	do	Carl Steckelmann.
165349	Staff, walking.....	do	Do.
166114	do.....	West Africa.....	Heli Chatelain.

The stilt and the stilted shoe scarcely enter into this study. The latter is more for lifting the feet out of a wet environment, or in some countries to elevate the bodies of persons of high degree. There is an endless variety of stilted shoes in the Mohammedan areas, in Persia and in Japan.

The stilt finds favor in certain parts of France, but here they serve chiefly to lift the shepherd to enable him to keep his eye on his flock. They are, in company with his staff, a kind of tripod watchtower or light-house.

The Popular Science Monthly records a race between pedestrians, stilt walkers, and horses from Bordeaux, France, over a course of 400 kilometers. The pedestrians dropped out at 235 kilometers. At the end of sixty-two hours the race was completed, the horse reaching the goal twenty-eight minutes ahead of the best stilt walker.¹

One of the favorite amusements among these people (Washington Island, Marquesas,) says Langsdorff, is running on stilts over paved dancing places, children being thoroughly habituated to the exercise by the time they are 12 years old.²

Carved stilts of the Marquesas islanders, attached to bambo handles, beautifully etched, are in the Christy collection and the Munich Museum as well as in the U. S. National Museum.³

LOCOMOTION AND BURDEN BEARING IN THE AIR.

The serpent, having no limbs whatever, would seem at first sight to be terribly handicapped; yet, in the language of Professor Owen, "it can outclimb the monkey, outswim the fish, outleap the jerboa, and suddenly loosing the close coils of its crouching spiral, it can spring into the air and seize the bird on the wing." Here we have the spiral spring in nature before it was devised by man.

¹Popular Science Monthly, New York, 1894, XLVI, p. 284; also Guyot-Danbes, "Stilts and Stilt Walking," *ibid.*, XL, p. 467.

²Langsdorff, "Voyages," London, 1813, I, p. 169.

³Figured by Ratzel, "Völkerkunde," II, pp. 133-134.

Flying animals conform to this law of variety of gifts. Thus we have birds, like the penguin, which dive and swim, but can not fly; others, like the gannet, which dive, swim, fly, and walk; others, like the ostrich, which run, but neither fly nor swim, and numberless birds which fly well, but have only slight pedestrian powers.¹ Those who enjoy the contemplation of nature, as the tireless pedagogue of man, will find innumerable examples in this portion of the traveling art. Every kind of ascending and descending obtrudes itself on the human imagination as an example and a challenge.

It has been previously remarked in this paper that through the exercise of the faculty of invention locomotion in the three elements, to wit, on the land, in the water, and in the air can be prosecuted further, longer, and more effectually by man than by any other living beings whatever. Traveling about and moving of things require not only horizontal motion, but movement upward, and in primitive life this may be considered under the general head of climbing.

The inclined plane is the most simple of the mechanical powers. It exists everywhere in nature, and simply in following the lines of least resistance animals, especially the ruminants, have covered the earth in its elevated portions with a network of paths and trails which have been subsequently adopted by aboriginal peoples.

The whole subject of the inclined plane, in its relation to travel and transportation, would better be considered after the division of roads; and even devices like stairways, such as may be seen in various parts of the world cut in the highways in order to facilitate locomotion and to get over difficult places, would also better come under the same division.

The discouragement of travel is quite as great among the wealth of nature as amid its poverty; the magnificent forest, where there can be no track and where the traveler must cut and climb for himself, is just as tenantless as the dry and thirsty land where no water is. But there is a small class of devices or inventions for mounting trees and other objects which may be considered apart from the general topic of roads.

Nowadays the patent elevator carries freight and passengers to the tops of buildings over twenty stories high, but in the beginning men knew how to ascend trees by the simple use of hands and feet. To facilitate this operation, however, among very low savages will be found a small class of inventions which at once divides itself into two species; one leading to the perfection of the ladder, the other is attached to the human body, and renders more effective the grip of the hand and the feet in the ascent. This class finds its latest expression in the devices used by those engaged in laying and repairing telegraph wires at the top of the long poles. The loops on the savage man's feet are the spikes on

¹ Cf. Jeremiah Head, Rep. Brit. Assoc., 1893, pp. 860-873.

the climber's boots, and the coarse vine about the tree and the waist of the former answers to the broad strap used by the latter. The action is the same; the man's body is alternately shortened by drawing up the feet and lengthened by straightening the body.

The ladder was a common feature in ancient warfare. Besieging by escalade appears frequently in Assyrian sculpture in the works of Layard. In fact, the ladder is a carrying instrument, that may be easily carried in turn, a portable stairway, in which the maker's problem is to get an elevating device of the greatest efficiency combined with the least weight and inconvenience. It would lead too far away from the subject to consider now the topic of ladder and antiladder in ancient warfare.

All through the Malay area, for many purposes not necessary here to discuss, the houses are erected above ground, and are approached by ladders, which may be drawn up, and indeed are difficult to mount except by those who are accustomed to doing so.

Forrest, in his voyage, speaks of the ladder as a long, notched stick, made of the clove tree, and used by the Malays to ascend to their houses, which he declares to be usually built on posts above the ground.¹

It will be remembered in this connection that aboriginally all the stone and adobe architecture of the southwestern States of the Union was conceived on the idea of the greatest possible use of the movable ladder (fig. 11), not only in ascending from the outside, but also in descending to the different apartments. A ladder of stout bamboos, to which cross steps are lashed,

shored or braced with bamboos extending from vantage points to the ground, is shown in *Le Tour du Monde*.²

Raffray figures a New Guinea house on trestlework, access to which is gained only by shinning up a group of five bare poles close together at the top on the doorsill and spread out a little below, where they rest on a small platform on top of short piles.³

All travelers among the Kamchadals and the Koraks speak of the ladder by which their underground dwellings are entered. It is a log with holes cut into it as steps. One is figured in Bush's work⁴ as the stairway upon the light-house at Ghijgha at the northern end of



Fig. 11.

PRIMITIVE NOTCHED LADDER
FROM TUSAYAN, ARIZONA.

From a figure in Mindeleff's "Study of
Pueblo Architecture," Eighth Annual
Report of the Bureau of Ethnology.

¹Forrest, "Voyage to New Guinea and the Moluccas," p. 33; E. Best, *Journ. Polynesian Soc.*, Wellington, 1892, 1, p. 12; Ellis, "Polynesian Researches," London, 1859, 1, p. 57.

²Vol. 1, p. 9; also Wallace, "Malay Archipelago," New York, 1869, pp. 66, 207.

³Cf. Ratzel, "Völkerkunde," II, p. 269.

⁴"Reindeer, Dogs, and Snowshoes," New York, 1871, p. 352.

Okhotsk Sea. The handy use of the ladder is spoken of as a dextrous feat.

The Cosumnes of California ascend the piñon trees to the height of 30 or 40 feet by means of spliced poles long enough to reach the first limbs. The pole was held in place by Indians on the ground while an expert climber ascended and beat off the cones with a short pole.¹ This is not quite explicit. The splicing of poles is also known to the Amur people, who sometimes harpoon a seal 100 feet from shore by means of a spliced shaft.²

In the Eighth Annual Report of the Bureau of Ethnology, the architecture of all the Pueblos is elaborately worked out, and numerous examples will be seen of the manner in which these ladders are used by the inmates for ascending and descending.³

The ancient Mexicans, in mining, used a system of ladders not unlike those employed by the modern hod carriers in ascending to the top of a tall building, only they were of a much ruder sort. Mark Beaufoy, in speaking of these mines, says: "The carriers work their way to the surface by means of notched poles put across a part of the shaft in a zigzag fashion; and they then give their load to the breakers, who knock the ore into pieces exactly as if they were going to macadamize a road."

Squier, in speaking of the Mosquito Coast, describes a method of climbing the tree employed by the natives, but it is not certain that this method is aboriginal, since the population of the Mosquito Coast is extremely mixed. Here are his words:

Antonio had brought a kind of sack of coarse netting which he tied about his neck. He next cut a section of a tough vine and braided a hoop around one of the trees. Slipping this over his head and down to his waist he literally walked up the tree. Leaning back he planted his feet against the trunk, clinging to which first with one hand, and then with the other, he worked up the hoop, taking a step with every upward movement. In a minute he was 60 feet from the ground, leaning back and filling his sack with nuts. This done he swung his load over his shoulders, grasped the tree in his arms, let the hoop fall, and slid rapidly to the ground.⁴

Mercer describes the ladders made by the women of northern Yucatan for descending into the water caves as made of boughs, the rungs bound on with twigs. On a series of them he descended into the cave of Actun Chack.⁵ A similar water cave at Caba Chen is entered by a staircase of one hundred stone steps.

Aeronautics seem to have been a very early study. The inquiry, "Birds can fly, and why can't I?" seems long ago to have entered ingenious minds. Archytas, of Tarentum, as far back as 400 B. C., is

¹ Cf. Mooney, *Am. Anthropologist*, 1890, p. 259.

² Schrenk, "Reisen und Forschungen im Amur-Lande," III.

³ Eighth Ann. Rep. Bureau of Ethnology, fig. 46.

⁴ Squier, "The Mosquito Coast," London, 1857, p. 62.

⁵ H. C. Mercer, "The Hill Caves of Yucatan," Philadelphia, 1896, pp. 92, 140; Morelet, "Travels in Central America," New York, 1871, pp. 327, 420.

said to have made a bird that could fly. But up to the moment of this writing neither freight nor passengers have been carried through the air by the force of the wind or by any engine.

The balloon belongs to the epoch of chemistry, the eighth in the series of powers put to work by man (page 240). It was not until human ingenuity had succeeded in alienating and confining hydrogen that such a device as a balloon was thought of.¹

Dr. Emil Schmidt figures a Comorin man climbing the palm tree to gather the palm wine. The essential parts of the apparatus are (1) the loop uniting the feet and giving a bearing against the tree, (2) the seat and its sling passing from the ends of the seat about the tree and inclosing the man. The climber rests alternately in the seat and on his feet as he hitches himself upward.²

In the U. S. National Museum is a model of "The palmyra climber and his implements," from Ceylon, acquired at the Chicago Exposition. A man with the apparatus attached to himself is mounting a palm-tree and gathering the sap.

The following list mentions all of the objects connected with this operation: (1) The knife and the basket; (2) the cocoanut-shell bottle which contains an oil for rubbing around the tree to prevent the ants from getting to the toddy pot; (3) the chaunam basket of the toddy drawer, containing lime to put into the pot to prevent fermentation; (4) the short club of the toddy drawers, used to beat the young tender spathe for preparing it; (5) the double stick used by toddy drawers for pressing the young tender spathe to facilitate the flow of sap; (6) the toddy drawer's basket; (7) the toddy pot; (8) the leather piece to protect the breast of the climber; (9) the leather piece to protect the ankles of the climber; (10) the foot brace used for the feet in climbing.

The parts of the palmyra are (1) young tender palmyra leaves; (2) green palmyra leaves; (3) dried palmyra leaves; (4) the bottom of a leafstalk encircling the tree; (5) the young spathe of a palmyra tree and toddy pot; (6) the tender fruit bunch of the palmyra on its first appearance; (7) the young fruit bunch of the palmyra half grown; (8) the amateur fruit bunch of the palmyra; (9) the full-grown unripe fruit bunch of the palmyra; (10) the fully ripe fruit bunches of the palmyra.

Ellis says of the Polynesian climbing that the cocoanut trees are often 60 or more feet high, with a tuft of leaves on top. Yet the natives gather the fruit with ease. A little boy strips off a piece of bark from a puran branch and fastens it around his feet, leaving a space of 4 or 5 inches between them, and then clasping the tree he vaults up its trunk with greater agility than a European could ascend a ladder to an equal

¹Cavendish discovered hydrogen in 1766, and Montgolfier's first balloon was sent up in 1783.

²"Reise nach Südindien," Leipzig, 1894, p. 101.

elevation. When they gather a bunch at a time they lower them down with a rope.¹

The *Ætas* or pigmy negritos of the Philippines are said by Gironiere to be prodigiously active in climbing trees, clasping the trunks with their hands and setting the soles of the feet against the trunk.²

The Marquesans climb the highest trees with incredible celerity, not with the knees pressed close to the trunk, but with the toes spread out. They will climb the steepest rocks with extreme facility; in running they are not equally expert.³

Lumholtz, in his work, "Among the Cannibals" (p. 89), speaks of the Australians climbing huge trees by means of the *calamus* (*Calamus australis*), native name Kamin. In a sketch the native Australian is represented as climbing a tree by means of a piece of vine, the function of which is simply to lengthen his arms so that he may grasp the trunk. He has no appliances upon his feet whatever, grasping the tree with his knees and toes for an instant, and before he has time to fall, he throws the vine higher up where it catches upon the rough bark, and he is thus able to pull himself a little further along⁴ (fig. 12). In the Malay and Indian areas the climber has a loop connecting his two ankles. This device is to increase the grasp of his feet upon the tree and to form a ratchet in the rough bark, which device sustains the body of the climber until he can throw his loop higher up.



Fig. 12.

AUSTRALIAN TREE-CLIMBING DEVICE.

The Indians of southeast Alaska understood the process of climbing trees by means of a stout line made of twisted cedar bark fiber. In the Emmons collections in New York from that region are two specimens of the apparatus thus used.

Lieutenant G. T. Emmons, U. S. N., whose superb collections from the Tlingit area are without a parallel, sends to the U. S. National Museum a climbing device, which in its complexity reminds one of the palmyra climber of India. It is No. 168806, is 32 inches long, nearly

¹Ellis, "Polynesian Researches," London, Bohn, 1, p. 57.

²"Twenty Years in the Philippines," quoted by E. Best, Journ. Polynesian Soc., Wellington, 1892, 1, p. 12.

³Langsdorff, "Voyages," London, 1813, 1, p. 174.

⁴Also Standard Natural History, VII, p. 35.

6 inches wide, and $1\frac{1}{4}$ inches thick in its strongest part. It is made of cedar, and this piece of wood has indeed a double function. The greater part is like a swing board or boatswain's chair, having its upper side chamfered for the rider, and the underside carved to represent his totem. Holes are bored for this stout cedar rope, which is knotted at one end and passes through the outer hole. The other end is rove through the inner hole and has a long, loose end. Outside of this swing-board arrangement is carved a portion which resembles a cleat and has that function.

Lieutenant Emmons informs the writer that he has not seen this apparatus at work, though he was very anxious to do so. It appears, however, that the woodcutter or carver, as the case might be, sits upon the seat, puts the rope around the tree and through the inner hole and

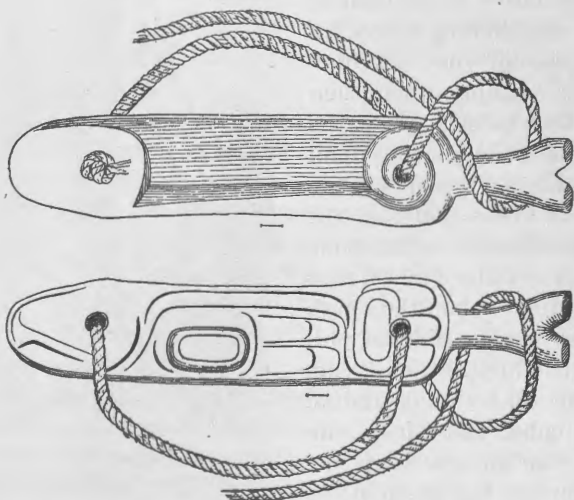


Fig. 13.

TREE-CLIMBING DEVICE OF THE TLINGIT INDIANS, SOUTHEASTERN ALASKA.

Cat. No. 168806, U. S. N. M. Collected by Lieut. G. T. Emmons, U. S. N.

makes it fast, by one or more half hitches, to the cleat. He uses the apparatus in climbing the tree in the same way it is employed in India, and also uses it as a boatswain's chair in holding himself in position while he is operating upon the trunk. This is the only example the author has ever seen or heard of belonging to this class in America (fig. 13).

Accompanying this specimen and probably independent of it is a much smaller device yet quite as effective, as will be seen in the drawing. A number of long strips, or ribbons, of cedar bark are doubled in two sets so that by their middles, for a foot or more, they are twisted into a two-ply rope forming a stout loop, and this is wrapped with a sennit of cedar bark so as to hold the loop in place. The ribbons are then laid out edge to edge for the distance of 3 feet or more and used

as a warp across which, by open zigzag, a continuous line of twine weaving is carried from one end to the other. By this operation the ends are gathered in and wrapped with a three-ply braid. The remaining part of the ribbons are then split or shredded and twisted into a fine three-ply rope. The loop in this example serves the same purpose as

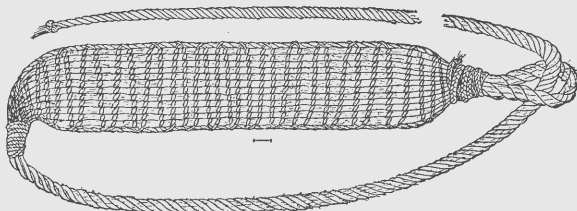


Fig. 14.

TREE-CLIMBING DEVICE OF CEDAR BARK USED BY THE TLINGIT INDIANS,
ALASKA.

Cat. No. 168807, U. S. N. M. Collected by Lieut. G. T. Emmons, U. S. N.

the cleat in the other. The broad band is the boatswain's chair and the finely twisted rope passes around the tree through the loop and is made fast by half hitches. The purpose of this seems to be the same, although Lieutenant Emmons had not the good fortune to see this example at work (fig. 14).

CLIMBING APPARATUS IN THE U. S. NATIONAL MUSEUM.

Museum number.	Specimen.	Locality.	By whom contributed.
151338	Climbing ropes.....	San Thomé, East Africa.	Heli Chatelain.
152626	Tree climber.....	Southwest Africa.....	Carl Steckelmann.
165352	Climber, Lukozo.....	Mayumba, Africa.....	Do.
168806	Climbing implements.....	Tlingit, Alaska.....	Lieut. G. T. Emmons, U. S. N.
168807	Climbing implements, cedar bark.....	.....do.....	Do.

SNOW GOGGLES.

After the long arctic winter comes the trying season of the morning, when the low sun shining over the glassy ice nearly blinds the hunter and compels him to utilize his inventive faculty to the utmost. There are two lines of patents, as we might call them, for protecting the eyes under the circumstances—the visor and the goggles or eyeshade with slits. In the U. S. National Museum the visor reaches its climax in the highly ornamented kaiak hat of the Aleutian seal and otter hunter and its counterpart, worn by the Giliaks on the Amur, but these belong to water travel.

There is in the U. S. National Museum (Cat. No. 68141) a pair of snow goggles obtained by the U. S. Fish Commission from one of the crew of the whaling brig *George and Mary*. The collector affirms that such objects are used not only by the Eskimo but by United States

and Hudson Bay whalemens to shield the eyes from the glare of the sun. The example here referred to (fig. 15) is made of polished spruce. The eye cavities and the nose groove are of standard eastern type. The eye slits, however, are extremely regular, and the whole apparatus was certainly made with steel tools and goods polishers. There is not a shadow of a visor on this example. The head band consists of a strip of red flannel and loops of braided sinew, the last named being the only really aboriginal feature about the specimen. (Cat. No. 68141, U. S. N. M., $4\frac{1}{4}$ inches in length, collected for the U. S. Fish Commission by J. Temple Brown.)

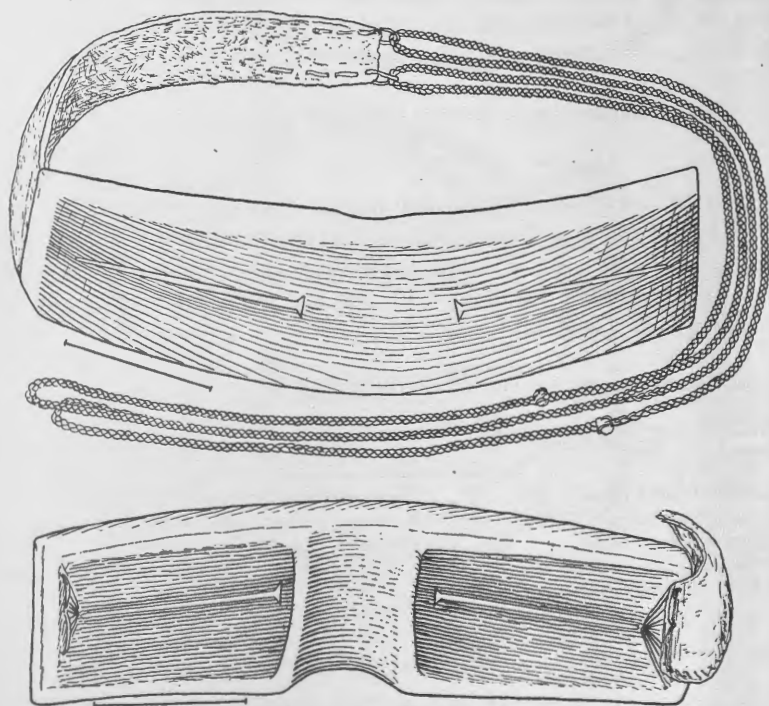


Fig. 15.

SNOW GOGGLES WORN BY HUDSON BAY ESKIMO.

Cat. No. 68141 U S N M Collected by J. Temple Brown.

Ravenstein mentions ophthalmia, from the action of the snow, as a dire affliction among the Goldi, terminating at an advanced age in blindness.¹

The visor is also a common defense for the eyes on land, and in this capacity attains its most elaborate development in medieval armor. It has been previously said that in hot countries, where there are at least twelve hours of sunset or shadow every day, most peoples take no pains to shade the eyes. The fez, the turban, and the bare head are in vogue. The Laplander, however, wears a far-projecting visor on

¹ Cf. "Russians on the Amur," London, 1861, p. 97.

his cap. So does the Russian and so do most Asiatics. The rim of the thousand and one styles of hat made in straw and palm leaf is partly visor for the eyes, partly sunshade, and partly umbrella, but always the utensil of the traveler. The essential part of the snow goggles, however, is the provision for the eyes immediately. In a great many masks throughout the world there are little holes, narrow slits, and openings, through which the actor may peep. In the same manner the goggles will be found divided into those in which the eye peers out through a slit or slits and those in which it looks out through elliptical holes. These slits and holes are in various structural relations with the visor, giving rise to many local types of apparatus for the same function. The climax of the invention in cultured areas is the goggle with colored glasses. Among the Tibetans the glare of the sun is shut off by means of a silken network, of which the universal veil in civilization is a refinement. It will be seen also that the Eskimo has somewhere caught the notion of our modern wire screen over the eyes of persons suffering with inflammation of this organ, only he substitutes tubes of wood for the wire gauze and smoked glass for the refined colored glass. Beginning with the purely aboriginal device there is in the U. S. National Museum collection a complete series, showing the insinuation of civilized ideas into the savage mind.

The almost universal custom is to blacken the inside of the goggles to further exclude the glare and strong reflection. Where this is not done the dark color of old wood renders it unnecessary. Some of the specimens in the Museum are smoked, many are rubbed with graphite, others are painted black. There is no lack of modern appliances, since the Eskimo have been under the discipline of the white man from two to nine centuries.

Bonvalot figures a petty chief in the western borders of Tibet wearing snow goggles over his eyes.¹ From this point the apparatus may be traced eastward, and it will be convenient to examine first the Asiatic specimens and after that the Eskimo types, in order to note the flourishing of varietal changes under stress of material, of climate, of ethnic genius, and of outside influences.

On the tundras of northeastern Siberia the sun of spring, reflecting from the glassy surface of the melting snow, almost blinds the Korak drivers of the dog sledges. They can not wear the smoked goggles and watch their teams, so they wear strips of tin perforated with small holes or having long, narrow slits cut through them, while others are of wood, shaped so as to fit the upper part of the face, through which are cut narrow slits, one for each eye.²

Hooper states that no kind of snow goggles or spectacles are used by the Tuski to protect the eyes from the glare of the snow in springtime, for the people suffer dreadfully from snow-blindness and ophthalmia.

¹ "Across Tibet," New York, 1892, Cassell, p. 233.

² Cf. Bush, "Reindeer, Dogs, and Snowshoes," New York, 1891, p. 349.

To relieve this the skin on the temples is perforated and a kind of seton is inserted.¹ The snow goggles and the visor are both known in that locality, so the reason for not wearing them is to be sought in the demands of the daily life in spring.

To the dress of the men (Chukchi), says Nordenskiöld, there belongs a screen for the eyes, which is often beautifully ornamented with beads and silver mounting. This screen is worn especially in spring as a protection from the strong sunlight reflected from the snow plains.² At this season of the year snow-blindness is very common, but notwithstanding this, snow spectacles of the kind which the Eskimo and even the Samoyeds use are unknown there. The various kinds of goggles used by the Eskimo have been explained; but Nordenskiöld describes neither those of the Chukchi nor those of the Samoyeds.

Parry relates that the affection of the eyes, known by the name of snow-blindness, is extremely frequent among these people (Central Eskimo). With them it scarcely ever goes beyond painful irritation, while among strangers inflammation is sometimes the consequence. I have not seen them use any other remedy besides the exclusion of light; but as a preventive a wooden eye screen is worn, very simple in its construction, consisting of a curved piece of wood 6 or 7 inches long and 10 or 12 lines broad. It is tied over the eyes like a pair of spectacles, being adapted to the forehead and nose and hollowed out to favor the motion of the eyelids. A few rays of light only are admitted through a narrow slit an inch long, cut opposite to each eye. This contrivance is more simple and quite as efficient as the more heavy one possessed by some who have been fortunate enough to acquire wood for the purpose. This is merely the former instrument, complicated by the addition of a horizontal plate projecting 3 or 4 inches from its upper rim like the peak of a jockey's cap. In Hudson Strait the latter is common, and the former in Greenland, where also we are told they wear with advantage the simple horizontal peak alone.³ It will be noted that Parry here refers to the simple visor, the simple goggles, and a mixed type in which the two are combined.

As with other classes of technical apparatus, so with the goggles or slit eye shade, there are excellent opportunities of studying the relations of invention and environment among the divisions of the self-same people. For the purposes of comparison the same regions may be marked off as were observed with the "throwing sticks,"⁴ to wit, Greenland, Labrador, Cumberland Gulf and Baffin Land, Mackenzie River district, Point Barrow, Kotzebue Sound, Bering Strait and vicinity, Norton Sound, Yukon River, Nunivak, Bristol Bay, Alaskan Peninsula and Kadiak, and other localities.

¹Hooper, "Tents of the Tuski," London, 1853, p. 185.

²Nordenskiöld: "Voyage of the Vega," New York, 1882, p. 473.

³Parry, "Second Voyage," London, 1824, p. 547.

⁴Mason, "Throwing Sticks in the U. S. National Museum," Rep. Smithsonian Inst. (U. S. Nat. Mus.) 1884 (1885), p. 279.

The U. S. National Museum possesses three examples of snow goggles from East Greenland, numbers 16-938-'40. Number 168938 is a large, plain eye shade of wood, like the front of a sailor's cap. Number 168939 is a hooded eye shade made by attaching a deep curtain of wood to the border of a visor. The example here mentioned is decorated with a large number of strips of ivory pegged on in shape of the plumes on a feather. Number 168940 is a pair of tray-shaped goggles whittled out with a metal knife. The eyes are bulging as in fig. 31. All these specimens were collected by Captain G. Holm, of the Royal Danish Navy, and given to the U. S. National Museum by the Ethnological Museum of Copenhagen. In pl. xx of Holm's "Ethnologisk Skizze" will be seen a cap made of unborn seal skin and one of fox skin, and each of these has a visor, the former of rawhide, the latter of wood. Beneath these are two snow goggles, one of the Bristol Bay type having a thick, hollow visor with an elongated, rectangular wide slit in front and a notch for the nose. The other has two lenticular openings for eye slits, a nose carved in relief between the eyes, and a nose slit on the lower margin. These examples have slight relation with the Central Eskimo type in which goggles and visor are combined¹

F. Nansen figures an old man at Cape Bille, East Greenland, wearing snow goggles, a simple block of wood with one long slit.² The Kaiak hat of this old man, consisting of a wooden ring, should also be noted.

In Holm's pl. xxxvi are two visors beautifully ornamented with little flat ivory figures common to East Greenland. His figure 3 is a hood for the face fitting against the forehead, projecting like a visor from which descends perpendicularly, a wooden curtain covered with ivory ornaments. This curtained visor is unique so far as the U. S. National Museum is concerned. If in any other museum exist like forms from other areas it will be interesting to know the fact.

Of somewhat similar type to Holm's tray-shaped snow goggles is an ivory specimen found by Boas in Idjorituaqtuin, Cumberland Sound (fig. 16). It is in the Museum für Völkerkunde, Berlin, and has the appearance of being very old. It is suggestive of light and neatly finished specimens from Sledge Island southward, but there is no intimation of a visor. Attention is called, however, to the two holes bored above the eye slits in precisely the spots where on the Bean specimen from Cape Lisburne two holes are utilized in fastening on a visor. Nordenskiöld's Port Clarence specimen seems to have holes for the

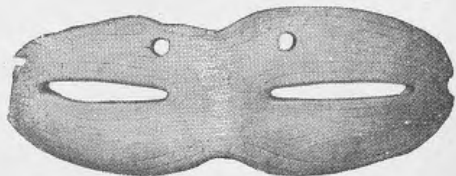


Fig. 16.

ESKIMO SNOW GOGGLES OF IVORY, FROM CUMBERLAND SOUND.

In the Museum für Völkerkunde, Berlin.

From a figure in "The Central Eskimo," by Boas, Sixth Annual Report of the Bureau of Ethnology.

¹ G. Holm, "Ethnologisk Skizze," Copenhagen, 1887, pl. xx.

² "Across Greenland," London, 1890, i, p. 361.

added visor in the same spot. But the little openings may have served as ventilators.

The examples of snow goggles from Fury and Hecla Strait in the U. S. National Museum are such as have been worn by white men or explorers. The one here figured was worn by Captain Hall in his Arctic explorations. It is sharply angular in outline, as if made by machinery from a block of wood 2 inches thick. Especial attention is called to the deep excavations for the eyes, which are separated by an equally

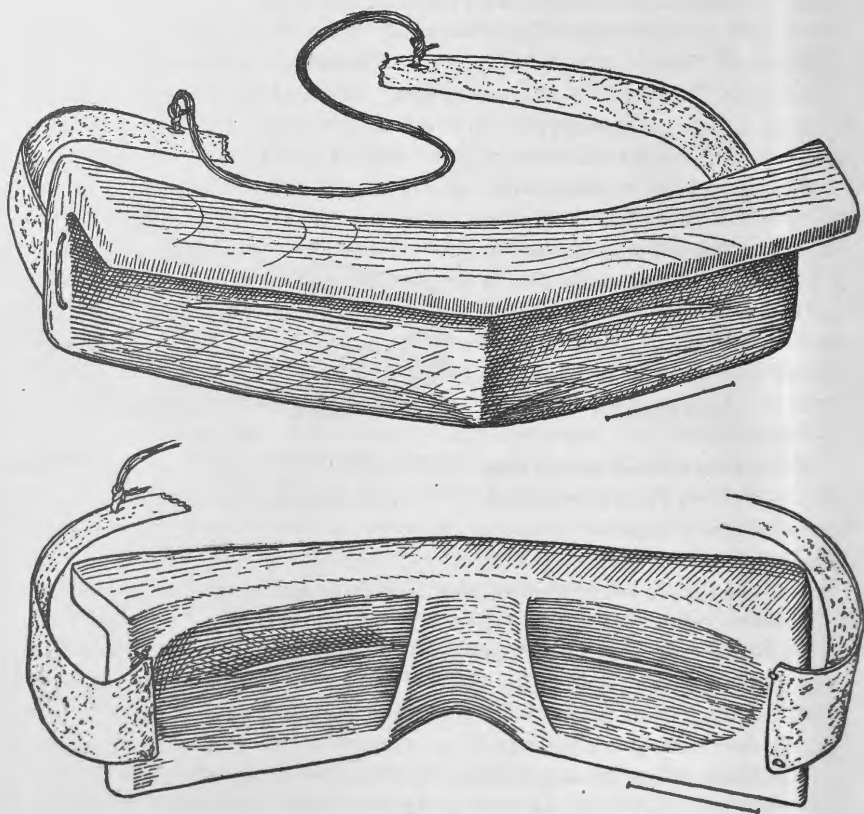


Fig. 17.

SNOW GOGGLES USED BY THE ESKIMO OF FURY AND HECLA STRAIT.

Cat. No. 10200, U. S. N. M. Collected by Capt. C. F. Hall.

deep transverse cut for the nose. The eye slits are, therefore, entirely distinct in front and in the rear.

In front, a visor projects squarely an inch over the eye slits, and is flat on top. The goggles are fastened on the head by a band of soft hide attached at the ends by means of sinew threads, sewed through holes in the wood. To further cut off the light, the eye cavities are rubbed with some black substance.

The specimen here figured (fig. 17) measures $5\frac{1}{2}$ inches in length, and is to be seen among the relics of the Hall expedition.

This angular form constitutes a type peculiar to the central region, where for centuries whalers have congregated, and through their trade as well as their mechanical assistance, profoundly modified the native arts. Similar to the specimens figured, are No. 10292, collected by Captain Hall, Nos. 29976-77-78, gathered in Cumberland Gulf by Mintzer, and also, though much ruder and newer looking, Nos. 90176 to 90188, from Ungava, north of Labrador, collected by Mr. Lucien M. Turner.

Captain Hall's collection also contains a specimen of the same general type carved from oak, but there is no information concerning the

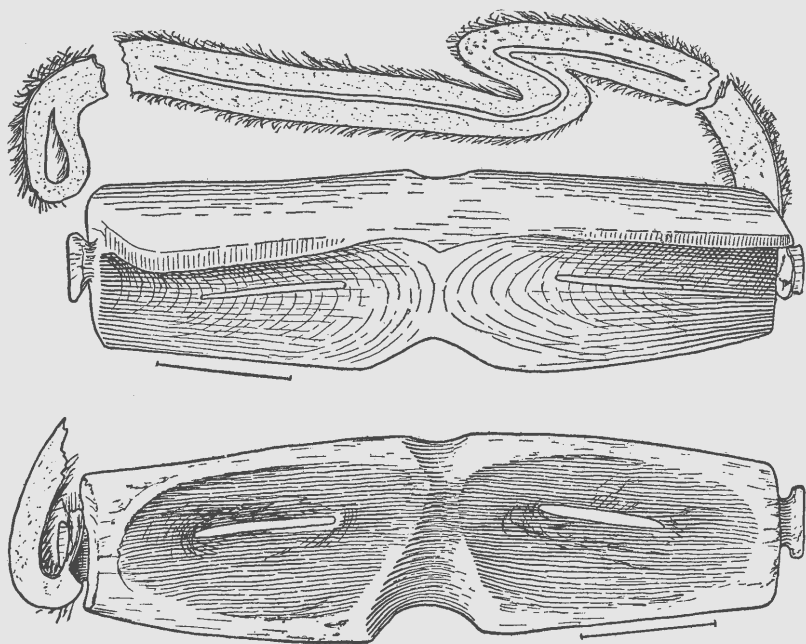


Fig. 18.

SNOW GOGGLES USED BY THE ESKIMO OF UNGAVA, NORTHERN LABRADOR.

Cat. No. 90188, U. S. N. M. Collected by Lucien M. Turner.

carver. The wood is from a whale ship. The visor in this example is not flat on top as the other, but slopes downward right and left from the middle.¹ (Cat. No. 10292, U. S. N. M. Length, $5\frac{1}{2}$ inches; height, $2\frac{1}{4}$ inches. Collected in Frobisher Bay.) Franz Boas says that the natives of Cumberland Gulf always use snow goggles in spring to protect them from snow-blindness. In describing them he calls the vizor-goggle type here figured the modern variety.

Lucien M. Turner brought home from Ungava several specimens of snow goggles similar to those shown in fig. 18. (Cat. No. 90188, U. S. N. M.)

¹ Cf. Parry, "Second Voyage," p. 547 and plate opposite p. 518, fig. 4, and plate opposite p. 14; Sixth Ann. Rep. Bureau of Ethnology, p. 575, fig. 529, p. 576.

The noticeable characteristics of this example are the short and wide eye slits and the shape of the visor, which is straight along its front border, making it quite shelving at its outer end and little projecting over the nose. There are buttons or knobs at the ends of the goggle for the strap of seal hide which is split along the middle so that one-half may pass above the occiput and the other half beneath it. These characteristics of the split headband and the buttons will be found elsewhere.

Somewhat similar to this example with little or no visor or projec-

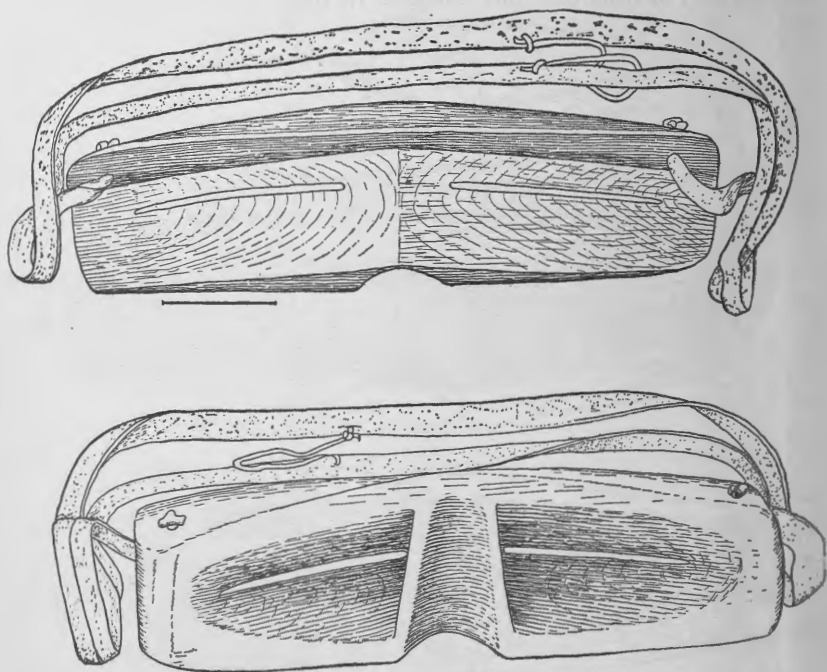


Fig. 19.

SNOW GOGGLES USED BY THE ESKIMO OF CUMBERLAND GULF.

Cat. No. 29978, U. S. N. M. Collected by W. A. Mintzer.

tion above the eyes are Cat. Nos. 90184, 90185, U. S. N. M., from the same area. The length of this example is $5\frac{1}{2}$ inches.¹

Nos. 29976-29978 in the U. S. National Museum are from Cumberland Gulf, and conform to the eastern type illustrated in the foregoing figures. The only characteristics in this example to which attention should be drawn is the heavy form of the goggles, the chamfered or sloped undersurface of the visor, and the additional little string between the two back portions of the head strap to prevent their spreading too wide apart. Length, $5\frac{1}{2}$ inches; height, $1\frac{3}{4}$ inches. Collected from Niautlik Eskimo, by W. A. Mintzer, U. S. N. (fig. 19).

¹ Cf. Eleventh Ann. Rep. Bureau of Ethnology, p. 222, figs. 46, 47.

In regarding the relation between these eastern examples and the environment it is well to put them into comparison with another apparatus in the same region, say the Ulu, or woman's knife. Turner's Ungava ulus look like harness makers' knives made and riveted in England or the United States. The other Hudson Bay, Cumberland Gulf, and Fury and Hecla pieces, out of foreign woods remind one of the patched up compound bows, the poorly hafted ulus, manufactured under the overshadowing influence of the whaler.

Between Fury and Hecla Strait and Cape Bathurst, just east of the mouth of the Mackenzie is a region unknown to the U. S. National Museum. Through the great generosity of Messrs. Robert MacFarlane,

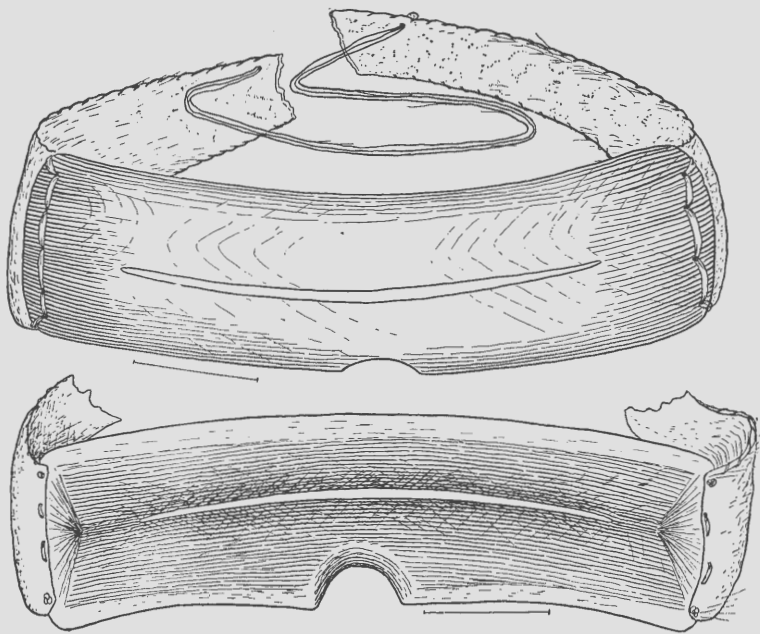


Fig. 20.

SNOW GOGGLES USED BY THE ESKIMO OF ANDERSON RIVER, CANADA.

Cat. No. 1650, U. S. N. M. Collected by R. MacFarlane.

B. R. Ross, C. P. Gaudet, Robert Kennicott, and others, especially the agents of the Hudson Bay Company, the Museum possesses rich treasures from the Mackenzie River district.

There are two well-marked types of goggles collected in this region, that with a single continuous eye slit and no visor and that with two independent disks. Both of them are seen elsewhere, but neither of them occurs in the east, so far as the U. S. National Museum collection goes. The former is just as rude and primitive as it can be; the latter is seen in regions easily accessible to traders.

No. 1650 in the U. S. National Museum is from Anderson River, east of Mackenzie River (fig. 20). It consists of a long tray-shaped block

of wood, red on the outside and blackened on the inside. It is roughly blocked out to fit in front of the eyes and to rest on the bridge of the nose. The headband is a broad strip of dressed skin sewed to the ends of the goggles. Especially should the student notice the continuous slit, for it is rare in Alaska on eye shades north of the Bristol Bay region. This specimen is $5\frac{1}{4}$ inches long, was made by the Kopagmut, and stands for the tray-shaped type of goggles to be noticed again.

Example No. 2167, from Anderson River, is carved in the shape of a trough, neatly polished, shaved out on the lower margin to fit the nose, but furnished with two long and quite neatly cut eye slits. The headband is a strip of dressed hide. Length, $5\frac{3}{4}$ inches. Gift of R. MacFarlane.

The second type, first appearing in the Mackenzie region and neighborhood going westward, is shown in fig. 21. The apparatus consists of two little wooden trays, with slits across their bottoms, attached to each other by being sewed upon a broad strip of dressed hide.

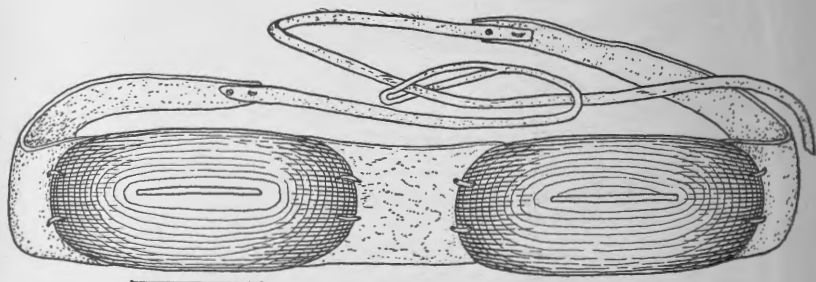


Fig. 21.

DOUBLE SNOW GOGGLES USED BY THE ESKIMO OF ANDERSON RIVER, CANADA.

Cat. No. 2147, U. S. N. M. Collected by R. MacFarlane.

To the ends of this strip are attached rawhide strings to complete the headband. This very simple device will reappear farther west in more elaborate form, and attention will be later directed to the incorporation of the dish-like eyepieces into goggles made of one piece. Mr. MacFarlane sent also from Anderson River No. 1651, a visor cut out of a single piece of wood. In the Museum collections there is no visor coming from Canada east of the Anderson River. But the East Greenland specimens shown in Holm's plates 34-36 must not be overlooked. This peculiar type abounds about Sledge Island (Aziak) and the Bering Strait. Length, 7 inches. It may be said here as well as elsewhere that other collections may contain different types from the regions named, and forms like the one just described may have been brought from Aziak to Anderson River in trade. The author can give his patient care only to reporting things as they are represented.

Captain Herendeen, an experienced whaler, says that the goggles with separate disks are to be seen at Point Barrow. This is not strange, since the natives know their relatives at the Mackenzie

mouth and trade as far west as St. Lawrence Island. The Ray party brought to the U. S. National Museum specimens of goggles from Point Barrow. These are of two kinds, the elongated dish-shaped variety, and a form soon to be described made of a single piece but suggestive of the style consisting of two disks.

No. 89701 is from Point Barrow and is mentioned by John Murdoch. Some specimens seen by him are of wood, and he describes one taken from a gravel bed 27 feet under ground in the process of sinking a shaft to obtain earth temperatures. But the example here figured (fig. 22) is of antler following the natural curve, divided longitudinally, with the softer tissue hollowed out. Mr. Murdoch never saw an example of this kind in actual use. It was obtained from a native, and there was no account of it given.

The second variety from Point Barrow, described by Mr. Murdoch,

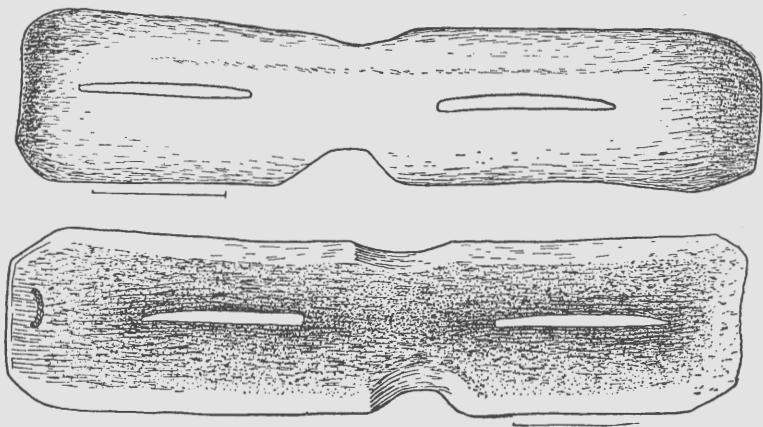


Fig. 22.

OLD SNOW GOGGLES OF ANTLER USED BY THE ESKIMO OF POINT BARROW, ALASKA.

Cat. No. 89701, U. S. N. M. Collected by Capt. P. H. Ray, U. S. A.

have along the top a horizontal brim about one-half inch high. Above this are two oblique holes opening into the cavity inside, which are for the purpose of ventilation to prevent the moisture of the skin from being deposited as frost on the inside of the goggles or eyelashes. Mr. Murdoch did not see these worn. He also calls attention to the appearance of air holes in specimens from Norton Sound and Ungava, and compares the visor with that on the eastern specimens¹ (fig. 23).

Following up the single-slit specimen from Anderson River, Dall sent to the U. S. National Museum from Cape Lisburne (68° 50', 166° NW.) wooden goggles (No. 46041) with a continuous aperture for vision. It is a compromise between the trough-shaped northern specimens and the hollow-visored type in the south. Indeed, it is a good example of the northern double visor, with wide continuous slit, over which the upper

¹ Ninth Ann. Rep. Bureau of Ethnology, p. 262, figs. 259-261.

side of the visor projects a little. Sinew cord is used to hold the apparatus on the head. Collected by William H. Dall and S. Bailey. It

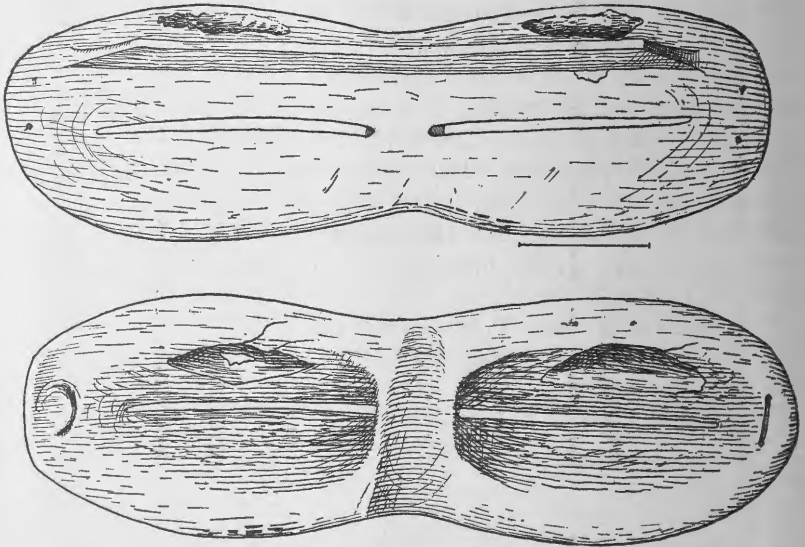


Fig. 23.

SNOW GOGGLES WITH VENTILATORS USED BY THE ESKIMO OF POINT BARROW, ALASKA

Cat. No. 89703, U. S. N. M. Collected by Capt. P. H. Ray, U. S. A.

is of wood, and measures $5\frac{3}{4}$ inches in length and $2\frac{3}{8}$ in height. The Eskimo at this point are called Nunatogmut.

Through the kindness of Lieut. G. M. Stoney, U. S. N., the U. S. National Museum has goggles from Kotzebue Sound, north of Bering

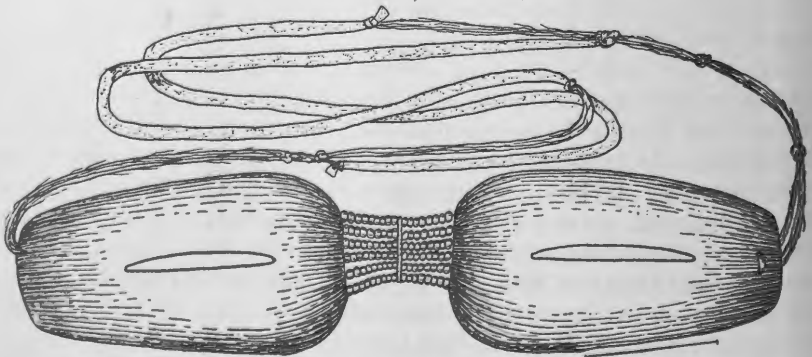


Fig. 24.

DOUBLE SNOW GOGGLES USED BY THE ESKIMO OF KOTZEBUE SOUND, ALASKA.

Cat. No. 127907, U. S. N. M. Collected by Lieut. G. M. Stoney, U. S. N.

Strait, No. 127907. They consist of two little wooden disks or trays, oval in outline, with rather broad eye slits (fig. 24). These trays are joined

together neatly by means of six strings of beads sewed into the margin of the disks and held in place in the middle by the threads passing through a "spreader" of rawhide. This device is common on beadwork farther south. The headband consists of sinew yarn and two little thongs of rawhide for the back of the head.

Example No. 63825 is from Point Hope. It has a single wide slit between a visor-like part above and a receding portion below, on the rear of which the notch for the nose is cut. The specimen is in essential particulars like the Cape Lisburne example, No. 46041.

Passing south from Kotzebue Sound to Bering Strait, Diomede Island, and Cape Prince of Wales, the U. S. National Museum does not possess an aboriginal specimen of goggles from this area. Instead, Nelson brought home a modern adaptation (fig. 25). It consists of a rectangular block of wood, with a shallow nose slit in the middle. The back of the block is gouged out roughly, and further cutting away provides two elliptical eye cavities. In front of the block is a rectangular bit of canvas,

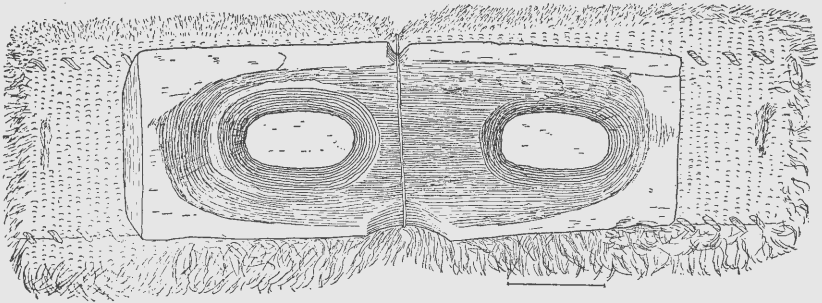


Fig. 25.

MODERN SNOW GOGGLES FROM DIOMEDE ISLAND, BERING STRAIT.

Cat. No. 63626, U. S. N. M. Collected by E. W. Nelson.

doubled and fitted with colored glass in front of the eyeholes in the wood. It is raveled around the edges and effectively excludes the light and air.

This is an interesting specimen, since it shows how thoroughly the most exposed places to foreign contact exhibit the greatest departure from the fundamental or primitive forms. The specimen figured is No. 63626, U. S. National Museum, and measures four and a quarter inches in length.

Just south of Bering Strait is Port Clarence, always an important location in Eskimo life and now the point at which the United States Government is making the experiment of introducing Siberian reindeer into Alaska. From this locality, through the kindness of Dr. Tarleton H. Bean, the U. S. National Museum possesses a very elaborate specimen of wood carving in the shape of snow goggles, No. 46137. The framework is in three pieces. This is easily accounted for since Port Clarence is in the land of driftwood. The upper and lower halves of the body

of the apparatus are joined by means of neat lashings of rawhide thong and strips of baleen. The visor is also a separate piece closely fitted and joined in the same manner. The especial characteristic of this specimen and its congeners not far away is the amount of carving in the round in front. In the rear the deep eye and nose cavities and in front the visor suggest Eastern examples. But the last named are angular and do not reveal the countenance. In the Port Clarence type

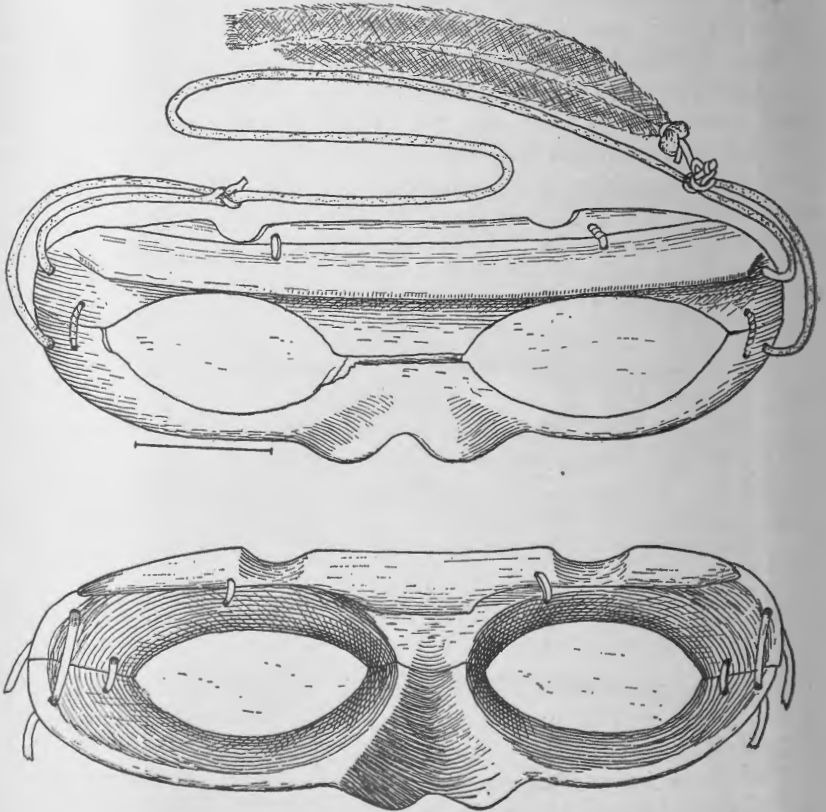


Fig. 26.

CARVED SNOW GOGGLES WITH VENTILATORS USED BY THE ESKIMO OF PORT CLARENCE, ALASKA.

Cal. No. 46137, U. S. N. M. Collected by Dr. Tarleton H. Bean.

every unnecessary scrap of wood is cut away outside about the nose and eyes. The effect of this is to reduce the weight and to give the appearance of a mask. The connection of the whole class with mask wearing would not be difficult to trace. The headband consists of a single string back of the head to which double strings are attached at each end in order to connect with the wooden frame. This specimen was worn by Dr. Bean in his Alaskan explorations for the U. S. Fish Commission (fig. 26). It is similar in typical characteristics to a

number of specimens in the U. S. National Museum collection from that point, excepting that the eye slits in the aboriginal specimens take the place of the glass. It should be also noted that in such examples this slit though continuous in front, as may be seen in the Bean specimen, is not continuous in the rear, being interrupted by the wood that forms the nose cavity. Mr. Tylor would say that this groove on the outside across the bridge of the nose is a survival of the old primitive continuous slit apparatus. Certainly it performs no function and does not add to the beauty of the specimen. Similar to this specimen are Nos. 45075, 45076, 45077, and 44769, from Sledge Island (Aziak), a little southwest of Port Clarence, sent to the U. S. National Museum by E. W. Nelson, and No. 44257 from Cape Darby on the northern shore of Norton Sound. From Port Clarence southwestward to Cape Darby is a continuous area. The specimen here figured is $5\frac{1}{2}$ inches in length.

Example No. 45080 is from Sledge Island. It is a very light and neatly made specimen. Its characteristics are the continuous slit in front, interrupted by the nose portion behind, the visor having a gracefully curved surface above, the outer portion carved in form of the face. Length, 6 inches. Collected by E. W. Nelson.

Example No. 45079, also from Sledge Island, is related to the northern hooded or visored type, only the wide eye slit is continuous and the notch for the nose is cut from the lower margin. The two Sledge Island specimens, Nos. 45079 and 45080, are excellent for comparison. The former is the double-visored type, trough-like and deeply hollowed on the back. The former is like the eastern examples, with separate eye and nose cavities in the rear and the eye slits only seem to be continuous in front. Length of the former, 6 inches. Collected by E. W. Nelson.

Sledge Island, or Aziak, is a small island between Port Clarence and Cape Nome ($64^{\circ}, 30', 168^{\circ}$ NW.). Through the energy of the indefatigable collector, E. W. Nelson, the U. S. National Museum is rich in specimens from this region. It will not be surprising to find here a complex art, since this little projection from the sea is a middle ground for the Norton Sound, also from Sledge Island and Bering Strait region.

The specimen (fig. 27) here figured (Cat. No. 44768, U. S. N. M.) is very beautifully finished off, sandpapered and polished, colored red on the outside and black within, as most examples are. The specimen suggests the types already mentioned at the north, consisting of two disks like spoon bowls fastened together, this time not by beadwork but by a narrow bridge of wood. The eye slits are wider open on the inner ends, a characteristic quite common. Above the eye slits is a narrow visor delicately carved. Length of specimen, $4\frac{1}{2}$ inches.

Example No. 44349 is a visor from Norton Bay made of a single block of spruce wood in shape of the front of a seaman's cap. Similar in form is No. 46309 from Port Clarence, collected by Dr. Bean; also, Nos. 45071, 45072, 45073, and 45074, from Sledge Island; No. 44144 from Cape

Darby; and No. 49068 from Rasboiniksky collected by E. W. Nelson. This type of eye protectors is better fitted for use on the water. Similar forms occur on Norton Sound and about the Alaskan Peninsula. The Aleuts wear specimens of unusually large size, and there are decorated forms used also in their ceremonial performances. Length, 6 inches.

From St. Lawrence Island, the middle ground or Cyprus between the American and the Asiatic Eskimo area, the U. S. National Museum possesses a specimen of the dish-shaped goggles, No. 63269, in which the continuous slit does not appear, but has been replaced by two irregu-

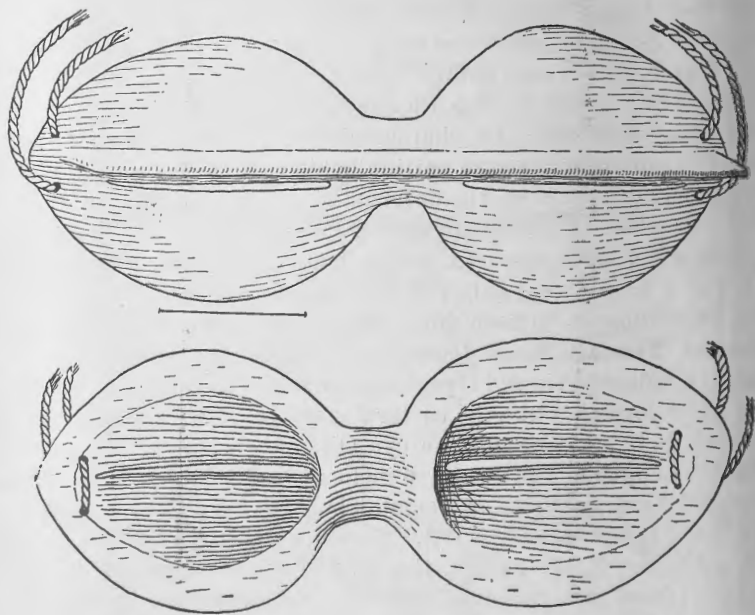


Fig. 27.

SNOW GOGGLES FROM SLEDGE ISLAND, ALASKA.

Cat. No. 44768, U. S. N. M. Collected by E. W. Nelson.

larly cut holes for the insertion of smoked or colored glass. Collected from the Kikhtogamut Eskimo by E. W. Nelson; length, $5\frac{1}{2}$ inches. It is not to be supposed that this aberrant specimen exhausts the native ingenuity on St. Lawrence Island. The smooth finish of the object, its normal shape, the holes for the headband, and the thong are entirely Eskimo. Even the little knot shown on the left of the bottom figure (fig. 28) is thoroughly savage, being made by cutting a slit in a thong half an inch from the end and then thrusting the end through the slit. It may be seen in many Eskimo implements where a button or toggle is needed to fit into a countersink in wood or ivory. But the eyeholes are bungling afterthoughts, many of which appear on Eskimo articles traded to the whites.

Cape Nome, just southeast of Sledge Island, should be represented in the U. S. National Museum collections, but unfortunately it is not. A creditable number of specimens, however, come from Cape Darby at the entrance of Golovina Sound and Bay ($64^{\circ}, 20'$, 163° NW.).

Example No. 44256 is from Cape Darby. Carved front and rear and resembling a masquerader's disguise, fitting the face neatly behind and cut away to a parallel surface in front. Over the eye slits is a visor three-fourths of an inch wide, which is not flat on top in this or any related specimens, as we have in the eastern type, but sloped up by a

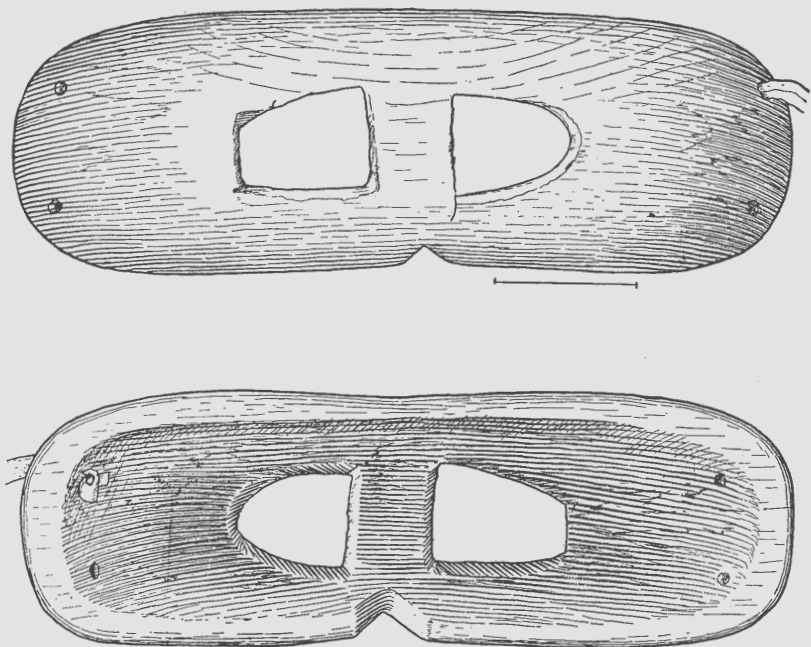


Fig. 28.

ESKIMO SNOW GOGGLES FOR COLORED GLASS, ST. LAWRENCE ISLAND, ALASKA.

Cat. No. 63269, U. S. N. M. Collected by E. W. Nelson.

curved surface to follow the lines of the eyebrows. Length, $6\frac{1}{4}$ inches. Collected by E. W. Nelson.

Norton Bay is in the northeast corner of Norton Sound. From this area comes, through E. W. Nelson, another set of goggles, No. 43929, of two separate disks. Two oval plates or trays of wood fit over the eyes with narrow aperture for vision. These are connected by means of three short sinew strings or cords. Length, $6\frac{1}{4}$ inches. Made and used by the Kaviagmut. In another specimen, No. 44329, the disks for the eyes are connected by a bridge of wood. The object is neatly carved and so symmetrical that it may be used either side up. It should be compared with No. 1650, from Anderson River and figures 24 and 27.

From the same area Nelson procured the specimen No. 44349 (fig. 29a), one of a series of plain visors like that on the front of a cap. From this point to Kadiak, south of Aliaska or the Alaskan peninsula, the visor becomes larger and larger until it entirely covers the head like a hat and extends in front 6 or more inches. In fact this sort of visor is in that area an equipment of the mariner, and will be more properly con-

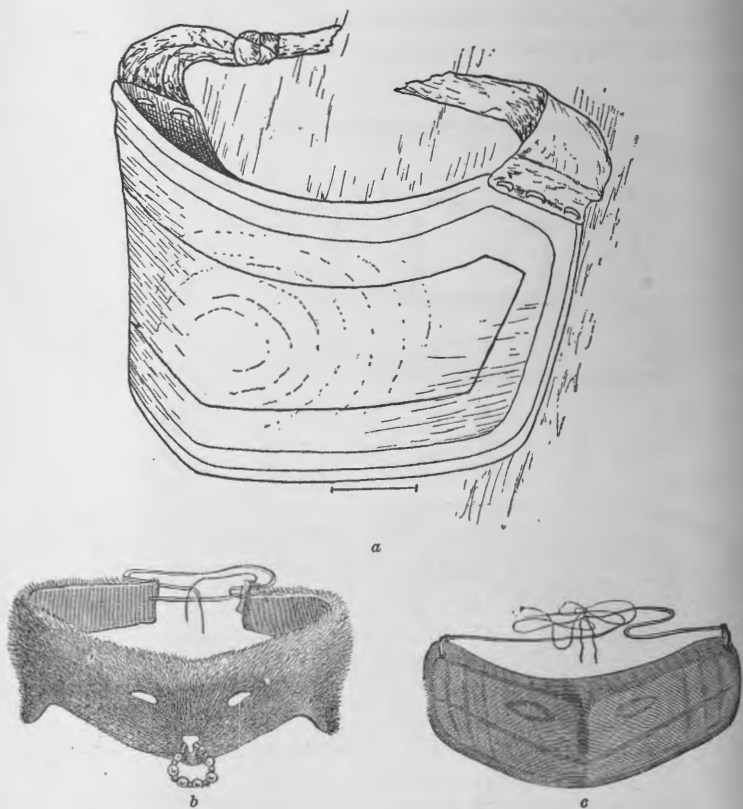


Fig. 29.

- (a) HUNTING VISOR USED BY THE ESKIMO OF NORTON BAY, ALASKA. Collected by E. W. Nelson.
 (b) GOGGLE AND EYE SHADE MADE OF THE SKIN OF A RINGED SEAL'S HEAD (*PHOCA FETIDA*). Gift of R. MacFarlane.
 (c) EYE SHADE OF CARVED WOOD USED BY THE ESKIMO OF ANDERSON RIVER, MACKENZIE RIVER DISTRICT, CANADA. Gift of R. MacFarlane.

Cat. Nos. 44349, 7733, and 1651, U. S. N. M.

sidered in the chapter on aboriginal water travel. The specimen is engraved with geometric lines.

With this visor must be compared a specimen from Anderson River, No. 7733, made of the skin from the face of a seal with the hair on, the eyeholes fitting over the man's eyes. This again leads up to the decoration upon No. 1651, U. S. National Museum, which is a visor of pine wood, upon the front of which the wearer has painted in blue lines the

countenance of the seal. The specimens here shown (fig. 29*b* and *c*) are the gift of R. MacFarlane.

As one might imagine, the greatest variety of goggles are received from St. Michaels and Norton Sound. No lessons in geographic distribution are to be drawn from these offhand. For the past one hundred years and more this region has been the entrepôt of Russian and Federal occupation. Hereabout the cunning natives early became acquainted with steel knives, hammers, saws, files, and boring tools, and here their creative and adaptive minds were first excited and modified by seeing new objects and forms to copy. Turner, Nelson, and others have sent to the U. S. National Museum pretty specimens

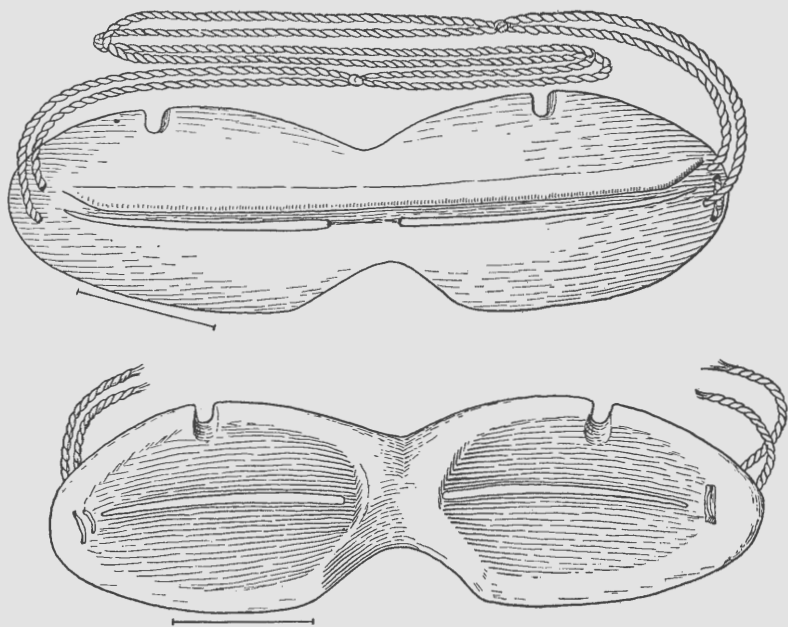


Fig. 30.

ESKIMO SNOW GOGGLES WITH VENTILATORS. NORTON SOUND, ALASKA

Cat. No. 32942, U. S. N. M. Collected by E. W. Nelson.

of goggles, consisting of two disks united by means of beadwork, No. 24339. Leather thongs also replace the beadwork as in No. 24686, made by the Unaligmut on St. Michaels. Length, 6 inches. By the first-named collector was secured a specimen on the same order, in which a narrow bridge of wood replaces the beadwork. In this specimen there is also a projecting ledge across the front above the eye slits. Length, $5\frac{1}{4}$ inches, Unaligmut. Nelson also contributes a double specimen from the Unaligmut, No. 32944. The specimen from Norton Sound, No. 32942 (fig. 30), is worthy of special study in relation to this area as the southern limit of certain types. There are in it suggestions of the elongated dish or tray shaped body of the extreme north, of the two trays

fastened together by means of beadwork, of the separate eye cavities and notch for the nose, of the narrow ridge or visor, and especially to be noted is the occurrence of neatly cut notches above the eyes, apparently for ventilation. It is a very daintily made specimen. No. 24340, from Unalakleet, resembles in front this example, the cavities are deeper in the rear, and there are no notches for ventilation. No. 32948 has also separate eye and nose excavations, but in front the visor is flat and the eye slits are similar to those farther north. Length, 5 inches.

Example No. 24341 is from Norton Sound, and is a mixture of the Sledge Island example, with the quasi continuous eye slit, and the northern example, with disk-like eyepieces. This specimen has a hood or visor over the eye slits, and is also remarkable for the projection or sharp curve outward, as much as $2\frac{1}{2}$ inches. Length, $5\frac{1}{4}$ inches.

Example No. 5581, from the Yukon River, is trough-shaped, much curved outward, having no projections or decorations, and one continuous eye slit. Collected in 1868 by William H. Dall. This example is as primitive in form as those made from antler above mentioned by Murdoch. Length, 7 inches.

Example No. 5579, from Yukon River, in fundamental form, like No. 5581, but notches for the nose above and below and a slight hood over the two eye slits give variety to the form. A slight furrow connects the eye slits in front, as in No. 45080. Length, $5\frac{1}{2}$ inches. Collected by William H. Dall.

Example No. 44328 is cut from a single piece in form of two disks or dishes, connected by the nose piece. The slits are precisely along a median line, so that the apparatus could be reversed. The head string is of twisted sinew. Length, $5\frac{1}{2}$ inches. Collected by E. W. Nelson.

Example No. 72906, from the Lower Yukon, is cut out of a single piece of wood in general form of the Kuskokwim specimen. The comparison ends there, for in the piece here described the block is hollowed out interiorly, a notch cut for the nose, and a long, wide slit with square ends separates the upper from the lower margin. The former does not project in the least. Length, $7\frac{1}{2}$ inches. Collected by E. W. Nelson.

Example No. 44330 is also a pair of goggles of two separate dish-like eye covers, united by means of sinew thread, decked with red and white beads. This is a very pretty specimen and has seen much use.

Example No. 43929, from Yukon River, is made of two oval dish-like pieces, with narrow eye slits in the bottoms, and fastened together by means of sinew twine; the headband of hide though doubled. These and others of the same type are neatly made, and cut away very thin just behind the eye slit. Length, $6\frac{1}{2}$ inches. Collected by E. W. Nelson.

Example No. 36351 (fig. 31) is lorgnette-shaped and was brought from Kushunuk, Bristol bay. The place where it was worn is unknown. A piece of wood is deeply hollowed in the rear so as to form two prolonged tubes. In front the wood is cut away in shape of the interior, and large openings are left for vision or for smoked glass. Collected by E. W. Nelson.

On the Lower Yukon River, in the delta that forms the southern boundary of Norton Sound, reappears a type of goggle described from Sledge Island, No. 48724, U. S. National Museum. That is, the eye slit is uninterrupted in front, but across the nose it is cut in only one-eighth of an inch and there is interrupted in the rear by the piece that forms the bridge of the nose. With this should be compared No. 38251, both collected by E. W. Nelson. Length, 6 and 6½ inches. From the Ekogmut Eskimo.

In addition to this marked type Nelson sends from the Yukon other patterns varying away from it into single slit forms; those in which the mask feature is suggested and rude pieces of degenerate style. In the Museum of Natural History, New York, Mr. Saville reports the three varieties from Norton Sound and Lower Yukon area, namely, two separate disks (No. 287, Emmons); solid block with slits or glass (Emmons 49297, 49430, and Terry, 22247 and 22248); and visor or hood

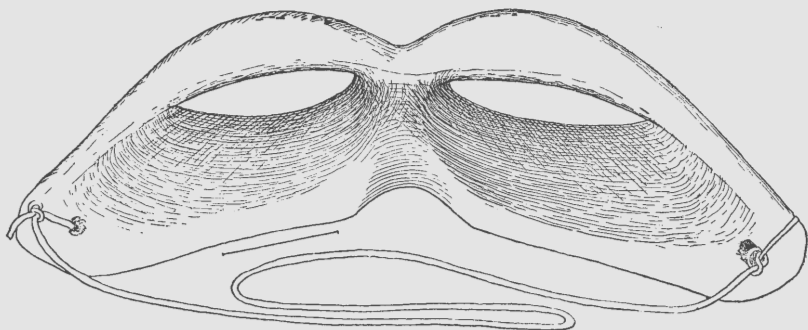


Fig 31.

VISOR SNOW GOGGLES USED BY THE ESKIMO OF KUSHUNUK, ALASKA.

Cat. No. 36351. U. S. N. M. Collected by E. W. Nelson.

(Emmons, 39, 47, 52, 53, 148, 455). Some new special features are presented by the New York pieces.

So far as the true goggles with narrow eye slit are concerned, the apparatus is not represented in the U. S. National Museum south of the Yukon mouth. Dall brought no specimens from the Nunivak and Nelson Island region. The next specimen southward in the U. S. National Museum collection is from the Kuskokwim region, carved out of a single piece of wood and strongly suggestive of the projecting shades made of wire gauze worn in civilized communities by persons suffering with weak eyes, as in example 36351. The specimen is quite maskoid, with huge eyebrows, and deep cut cavities. The whole is trimmed away in front to make the apparatus lighter to the wearer. Length, 6 inches. Collected from the Eskimo of Kushunuk, at the mouth of the Kuskokwim River, by E. W. Nelson. There is no evidence of glass having been used on this specimen. The long tubes in front of the eyes are blackened.

Lately, Mr. I. C. Russell, of the International Boundary Survey between Alaska and Canada, brought to the U. S. National Museum two pairs of goggles, No. 153427, from the Athapascan tribes on the upper Yukon. They are evidently birch-bark makeshifts on the suggestion of the double goggles of the northern area. Each specimen is made of two "pill boxes," of birch bark with diamond-shaped holes cut in the bottoms. These are joined together by a strip of birch bark sewed on.

Following up the idea that the Kuskokwim specimen was not designed for glass, the student comes to the typical Bristol Bay eye-shade (Ihugach-shu-duk). On top this apparatus is no more nor less than a common visor, seen all about Bering Sea and over the northern arctic zone, where wood abounds. If a visor an inch thick were hollowed out, cut away a little for the nose in one place, pared away on its under edge in front, blackened on the inside, that would be the double visored eye

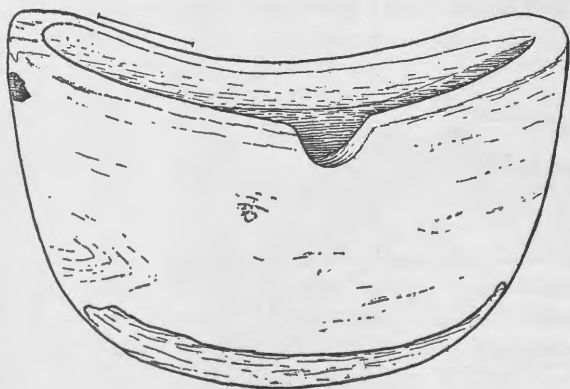


Fig. 32.

VISOR SNOW GOGGLES FROM KUSKINAK, ALASKA.

Cat. No. 127781, U. S. N. M. Collected by Wm. J. Fisher.

shade or goggles of Bristol Bay. The figure here given is of No. 127781 (fig. 32), collected by W. J. Fisher. The U. S. National Museum contains a great variety of this type. With this example should be compared No. 55930 collected by C. L. McKay, Nos. 127477 and 127478 from Togiak River, collected by Applegate, and No. 72515 collected by W. J. Fisher. The last named is an oddity, and is probably of very modern manufacture. Length of figure, $5\frac{1}{2}$ inches.

Example No. 55930 from Bristol Bay is in effect a typical double visor or a thick visor mortised through and painted black inside, the lower margin cut to fit the nose. In front the apparatus looks like the slightly opened mouth of a big fish. Most of the visor-like goggles are fastened with rawhide thongs. Length, 6 inches. Collected by C. L. McKay.

The accompanying illustrations (figs. 33 and 34) exhibit the structure of the double visor or elongated goggles. It is here recalled that at the extreme north this form does not occur, owing to absence of wood, and that at the extreme south the goggles with slits for the eyes are not to be found.

Indeed, while the goggles, the visor, and the double visor are all to be worn on the eyes, the first-named is to prevent ophthalmia in the hunter walking over the snow.

The second is the Arctic form of the universal sunshade, hat brim, eye shade, having a different technical treatment for every people and culture region.

The third is this likewise, and by its lower shelf is also a device for looking a long way down into the water. Many of Holm's East Greenland specimens having a visor top, and a deep curtain of wood around the margin enables a hunter lying on his stomach on the ice to see far down into the water and to guide the long-handled harpoon held by his companion. The wearers of the western examples are kaiak people who hunt their game with bladder harpoons, and it is essential that they should be able to follow them with the eye. Our modern deep-sea fishermen use a common bucket with a pane of glass in the bottom for looking down into the ocean.

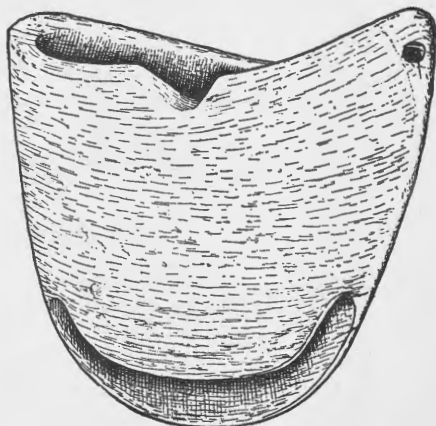


Fig. 33.

VISOR SNOW GOGGLES USED BY THE ESKIMO OF BRISTOL BAY, ALASKA.

Cat. No. 127784, U. S. N. M. Collected by Wm. J. Fisher.

The Aleut dress according to Strong was similar to that of the Koniagas, with the addition of a high peaked hat made of wood or leather. This hat had a long brim in front to protect the eyes of the wearer from the glare of the sun upon the water and snow, and was ornamented at the back by hanging upon it the beards of sea lions. The front was usually carved to represent some animal and the surface was overlaid with ivory carvings.¹

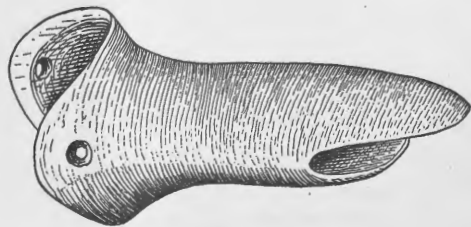


Fig. 34.

VISOR SNOW GOGGLES USED BY THE ESKIMO OF BRISTOL BAY, (SIDE VIEW).

Cat. No. 127784, U. S. N. M. Collected by Wm. J. Fisher.

Ground, in which a narrow T-shaped slit admits of both horizontal and vertical sight.²

From Fort Hall, Idaho, the U. S. National Museum possesses another

¹Strong, "Wah-kee-nah and Her People," New York, 1893, Putnam, p. 101.

²Harper's Magazine, 1895, xcii, p. 26, and F. Nansen's "First Crossing of Greenland," London, 1890, i, p. 50.

aberrant specimen of snow goggle or eye shade, No. 153545, collected by Mr. Danilson (fig. 35). This specimen is said to have been used by the Shoshones and Bannocks, who belong to the great Uto-Aztecan family; but the apparatus is made from harness leather, punched with a steel punch, cut out with a keen steel knife, and held on with worsted braid. The adjustable shutter is also a device somewhat above any-

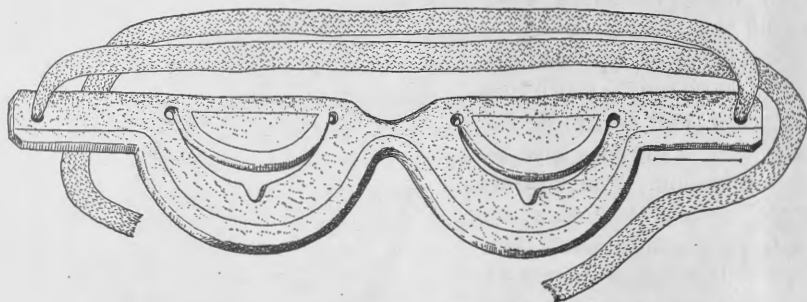


Fig. 35.

SNOW GOGGLES USED BY THE BANNOCK AND SHOSHONE INDIANS OF IDAHO.

Cat. No. 153545, U. S. N. M. Collected by W. H. Danilson.

thing in the way of eye screens exhibited by savagery. It serves the purpose of emphasizing what has been many times repeated by the present writer, that civilization modifies the working principles of savagery. This specimen furnishes a fitting close to the study of an implement that the whalers and fur hunters modified and carried from place to place. Local forms are not nearly so fixed as those of the throwing stick.

EYE SHADES AND SNOW GOGGLES IN THE U. S. NATIONAL MUSEUM.

Museum number.	Specimen.	Locality.	By whom contributed.
168938	Large wooden eye shade, plain.....	East Greenland.....	Captain G. Holm.
168939	Hooded eye shade, ornamented.....	do	Do.
168940	Tray-shaped, triangular eyeholes, large.	do	Do.
90176-90188	Angular type, more or less visor....	Ungava.....	L. M. Turner.
10292	Angular type, flat visor.....	Frobisher Bay.....	Capt. C. F. Hall.
29976-29978	Angular type, visor flat.....	Cumberland Gulf.....	W. A. Mintzer.
68141	No visor, machine made.....	Hudson Bay.....	J. T. Brown.
10200	Angular type, flat visor.....	Fury Strait.....	Capt. C. F. Hall.
2167	Plain tray shape, two slits.....	Anderson River.....	R. MacFarlane.
1650	Plain tray shape, single slit.....	do	Do.
1651	Visor, with face painted on.....	do	Do.
2147	Two small separate disks.....	do	Do.
7733	Visor and goggle, skin of seal's head.....	do	Do.
7478-7479	.....	Mackenzie River.....	Do.
89701-89702	Tray shape, two slits, antler.....	Point Barrow.....	P. H. Ray, U. S. A.
89703	Two slits, visor, ventilators.....	do	Do.
89894	Goggles from gravel bed.....	do	Do.
46041	Double visor, ventilators.....	Cape Lisburne.....	W. H. Dall.
63825	Tray shape, single slit, visor.....	Point Hope.....	E. W. Nelson.

EYE SHADES AND SNOW GOGGLES IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
127907	Two ovate disks separate	Kotzebue Sound	G. M. Stoney, U. S. N.
63626	Wood, canvas cover, glass eyes	Diomede Island	E. W. Nelson.
63269	Dish-shaped, eyeholes for glass	St. Lawrence Island	Do.
46309	Large visor	Port Clarence	T. H. Bean.
46101	Maskoid type, glass eyes .....	.....do	Do.
46137	.....do .....	.....do	Do.
45071-45074	Large, plain visors	Sledge Island	E. W. Nelson.
45075-45077	Maskoid with visor .....	.....do	Do.
45078	Maskoid, visor, ventilators .....	.....do	Do.
45079	Double visor like, single slit .....	.....do	Do.
45080	Tray shape, visor .....	.....do	Do.
44768	Two disks and visor in one piece .....	.....do	Do.
44769	Sledge Island type .....	.....do	Do.
44144	Plain visor	Cape Darby	Do.
44256	Maskoid, visor, Sledge type .....	.....do	Do.
44257	.....do .....	.....do	Do.
44329	Tray shape, one slit, reversible .....	.....do	Do.
44328	Double disk, slits in visor	Norton Bay	Do.
44330	Two separate disks .....	.....do	Do.
44349	Plain visor .....	.....do	Do.
24339	Separate disks	Unalakleet	L. M. Turner.
24340	United disks .....	.....do	Do.
43929	Separate disks	Norton Sound	E. W. Nelson.
24341	Double disk and visor .....	.....do	Do.
24686	Two separate disks .....	.....do	L. M. Turner.
33136	Visor and frog mask .....	.....do	E. W. Nelson.
33137	Visor and headband .....	.....do	Do.
32942, 32944	Double disk, single slit, air holes .....	.....do	Do.
32943	Tray shaped, slight visor .....	.....do	Do.
37351-37353	Visors, lorgnette style .....	.....do	Do.
37619	Plain visor .....	.....do	Do.
49102	Visor and headband	Pastolik	Do.
48684	Conical hat, with ornament	St. Michaels	Do.
153784	.....do .....	.....do	J. H. Turner.
5581	Plain tray, single slit	Yukon River	J. Y. Dyer.
5579	Maskoid, Sledge Island type	Mahlemut	W. H. Dall.
11441	Visor	Lower Yukon	Do.
38251	Slightly maskoid, two slits .....	.....do	E. W. Nelson.
38329	Visor .....	.....do	Do.
38704	Tray shape, one slit visor .....	.....do	Do.
38710-38712	Visor and headband .....	.....do	Do.
38837	Visor .....	.....do	Do.
38658	Tray shape, maskoid .....	.....do	Do.
48724	Tray shape, one wide slit .....	.....do	Do.
48996	Maskoid, no visor	Sabotnisky	Do.
49068	Visor and headband	Rasboiniksky	Do.
72906	Double visor, coarse	Lower Yukon	Do.
16221	Visor and headband	Nunivak	W. H. Dall.
38659	Visor	Kuskokwim	E. W. Nelson.
55930, 55931	Double visors, coarse	Bristol Bay	C. L. McKay.
36351, 36352	Lorgnette shape	Kushunuk	E. W. Nelson.
37351	Lorgnette leather visor .....	.....do	Do.
36404	Conical visor hat, ornament .....	.....do	Do.

EYE SHADES AND SNOW GOGGLES IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
38713-38718	Visor hats, plain .....	.....do	E. W. Nelson.
127477, 127478	Double visors	Kassian	I. Applegate.
90444	Conical visor hat, ornament	Kadiak	W. J. Fisher.
72515	Quadrangular visor .....	.....do	Do.
74720	Conical visor hat .....	.....do	Do.
127780, 127781	Double visor	Kuskinak	Do.
72515	Visor hat	Ugashik	Do.
1131	Visor hat, conical	Aleut	Capt. Bulkley, U. S. A.
5772	Painted visor hat .....	.....do	Capt. W. A. Howard.
11377	.....do .....	.....do	Vincent Collyer.
154073	.....do .....	.....do	Mrs. M. M. Hazen.
153427	Birch-bark spectacles, 2 pairs	Upper Yukon	I. C. Russell.
22286	Goggles from harness leather	Fort Hall, Idaho	W. H. Danilson
131053	Eye screen or network	Northeast Tibet	W. W. Rockhill.
167159	Eye shades and case	Lhasa	Do.

FOOT WEAR USED IN TRAVEL AND TRANSPORTATION.

Among the five typical classes of industries (page 237) the barefooted man and woman are common in the first two and the last two. The shoe is especially an accessory of travel; it belongs to the road. Even nowadays men wear their shoes to the field and work in the field barefooted. The same is true of women in all their drudgeries. Barefooted men and women are glorified in art, and in old religions both priest and worshiper remove the shoes. Ratzel has also noticed that sandals are rather peculiar to the road, and thinks they are more commonly made of hide than of wood or bast. He also calls attention to their wide extent.¹

Locations will be found where the traveling class are barefooted, but a close inspection of them will show that the people are maritime or that the climate is opposed to clothing the feet. Furthermore, it is difficult and seems useless to make the foot a decorative part of the body. Unclothed the foot is usually plain.

Bush speaks of Giliaks whom he met as far north as the Amur mouth with naked feet and legs in September.² They wandered over the jagged stones on the beach as though their feet were soled with iron, while the cold seemed to have no effect upon them whatever. Upon a stump of driftwood 6 feet long, six of them sat with their feet drawn up under their bodies. But when these same people go away from home, they and all other hyperboreans exhaust their ingenuity on foot wear and foot gear. It is said that in southern China the children's feet are seared to harden them.³

¹ "Völkerkunde," Leipzig, 1887, I, p. 67.

² "Reindeer, Dogs, and Snowshoes," pp. 81 and 104.

³ Chinese Repository, Canton, 1833, I, p. 29.

As previously mentioned the anatomy of the foot has excited some attention, but it is a wonder that no one has dwelt upon the foot as an instrument of human industry. There are multitudes of able dissertations upon the foot as a characteristic in comparative anatomy, but here the organ is regarded in the light of an instrument of locomotion, whose place saddles, wagons, cars, and the like were invented to fill, and whose burdens dogs, reindeer, llamas, camels, elephants, asses, horses, and oxen were domesticated to share. In this light its power, versatility, adaptability, recuperative attributes, elasticity, and endurance are beyond our praise. But in this chapter the foot itself is the starting point of a wonderful series of inventions.

In all countries where mere protection of the foot was the motive, those substances were chosen that were abundant and from which in a few moments new shoes could be constructed with a little knack and no special tools. Mackenzie says that the women who attended his Indians were constantly employed in making fresh moccasins of elk skin. Travelers in the tropics also note that when the foot demands protection, the material is always at hand, and that the natives have no trouble in providing themselves during their resting spells with an entirely new outfit.

Under the general name of foot gear must be included all that is attached to the foot and lower leg in walking, running, or carrying, for industrial purposes. Sandals, slippers, shoes, sabots, boots, stockings, greaves, snowshoes, ice creepers, and others to be mentioned, may be comprehended in a genus and treated as objects in natural history of which we may study:

(1) The structure, materials, methods of production and of application to the foot, varying from region to region.

(2) The elaboration, or evolution, or phylogeny, taking the more complex varieties and tracing them to their pristine forms, as a patent attorney would proceed in showing the serial development of a modern machine.

(3) Environmental influences. Since foot gear is devised for the double purpose of defending the foot from wear and tear, and of protecting it from the cold or heat, on mountain, plain, and bog; on open sward, volcanic slag, thorny undergrowth, and burning sand; from poisonous plants and noxious creatures, each and all of these have claimed a hearing from the inventor and stimulated ingenuity, giving endless variety to what would else appear barefooted monotony.¹

(4) Ethnic peculiarities. These are they that put the last finishing touches on all human productions. Anatomical form of the foot, the survival of old fundamental structures useful in their day and in some other region, the tribal art conceptions, stitches, knots, patterns, forms; the traditional and mythic emblems; names that are repeated in things—all these come out in an intensive study regarding any class of inventions.

¹Cf. The author's "Origins of Invention," London, 1894, Walter Scott, Chap. x.

The anatomy of the sandal includes the following parts or characteristics. Some of the parts may be absent, but that fact should be noted:

- (1) The materials and technique.
- (2) The sole, its form, material, and structure.
- (3) The toe piece, a thong or peg between the great toe and the next one or between other toes; a cap or cover or string over the toes—that is, the vamp or the primeval device that answered its purpose.
- (4) The instep pieces or straps, rising from the sole in front of the heel and uniting over the instep. In many oriental varieties there are short loops attached to the sole, and the lacing performs this function.
- (5) The heel, wanting from sandal and slipper or is turned down, especially in lands where one has to remove the foot-wear quickly, for social, political, or religious motives. This is true in Japan, and notably in countries under Mohammedan influences.

So there is an endless variety of thought expressed in the heels of sandals, as the material is vegetable or animal, according to the environment of the people and their work. Starting from the points on the margin of the sole just below the ankles, two short straps may run up to an ankle band, or a loop over the heel may join the sole at these points, or the lacing may run over the heel through loops at these points.

(6) The thong or lacing. It seems to one giving heed to the matter, that the shoemakers of old were more troubled and racked their brains more over the lacing of the sandal than on the structure of the sole. The desiderata are, to have a sole securely and flexibly attached to the foot, not to lacerate the foot unnecessarily, and to get the object off with as little trouble as possible. The Turkish slipper, worn slipshod or down at the heel, and the Japanese sandal, with toe string and instep bands simply, fulfill the conditions of easy removal—the former for ceremony, the latter for cleanliness.

There are two theories of lacing a sole to the foot—with toe strings and without them. In the last-named process a sole of leather has a number of slits cut about the margin and a sole of fiber has a number of loops woven in the same places. Through these slits or loops the lacing passes as on a skate or high shoe. By the first-named the toe string is the starting point of fastening, and the question whether there shall be any lacing at all is a matter of nationality.

Example No. 22192, from Yokohama, Japan, stands for a very numerous type of foot wear (fig. 36).

These very coarse examples (saudals) are made from the bark of walnut, or some very dark-colored bast. They are woven on a warp of four strands of the same material. There are six loops for lacing in front, two on the margin at the arch of the foot and four at the heel. These loops are made in the course of weaving, and are, in fact, a part of the selvage. At the proper place the material is car-

ried beyond the outside of the warp and doubled; the weaving then goes on as usual, but when the weft returns to form the next stitch on the selvage a half hitch is made around the loop to hold it fast in place, and then the weaving proceeds normally. The lacing is of coarse rope crossed over the toes, over the instep, and carried around the heel through the four heel loops as shown, and brought back over the instep and tied. Length of foot, $11\frac{1}{2}$ inches. Collected by Hon. Benjamin S. Lyman.

A widely disseminated form of sandal consists of the following parts:

- (1) Sole of rawhide, single or double, cut rights and lefts.
- (2) A toe piece passing up through the sole between the great and the fore toe. This piece is fastened underneath by a toggle or frog, cut out of the leather or rawhide itself, and flattened parallel with the sole or by a single knot in the end.
- (3) Side strap: in this class of examples formed by cutting two slits about an inch long at the margins of the sole under the arch of the

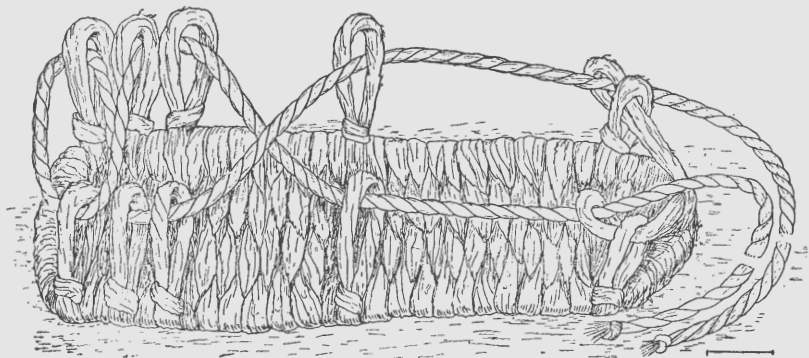


Fig. 36.

SANDAL OF BAST FROM YOKOHAMA, JAPAN.

Cat. No. 22192, U. S. N. M. Collected by Benjamin S. Lyman.

foot. A bit of rawhide passes down through one slit across the sole beneath and up through the other slit. The two ends extend 2 inches straight upward and are slit to receive the lacing.

(4) The lacing: a thong of leather slit at one end. Commencing at the little toe it passes backward through the slit in the side strap on that margin, making a half hitch. Thence it passes back of the heel and through the other side strap, and makes a half hitch. Thence it passes through the slit in the toe piece and through the slit at its own starting point, and is fastened off. Length, $9\frac{1}{2}$ inches in the example (figs. 71, 72) from Bolivia. Collection of Mrs. Fanny B. Ward. Other examples from Bolivia are made of rawhide, and two thicknesses are pegged together, the rows of pegs mimicking the stitching on the better class of Turkish shoes. Under the term *Baxae* in Smith's Dictionary of Greek and Roman Antiquities, two sandals of vegetable fiber are figured—one rounded in front, the other pointed, one woven

diagonally, the other in close wicker. These have three points of attachment—one for the toe strap and two at the margin under the ankles.

The shoe is a sandal that has grown up over the foot. The North American Indian moccasin is the simplest modern illustration of this. In a great collection of them it is hard to say where the sole leaves off and the upper begins. The evolution of this important element of clothing may be traced in two directions, forward or backward. Commencing with the first efforts to bring the sandal sole a little way over the foot or by dissecting a modern elaborate shoe and observing where, in what form, and from what motives each element made its appearance.

Tristram says that the word used for shoe (in the East) is different from that for sandals. The latter are simply soles of undressed hide, with the hair on the upper surface, and fastened with thongs, always carried by the traveler, who walks barefoot on sandy or grassy ground, but who finds them absolutely necessary for the rocky and stony paths of the hill country. Shoes, or rather as we should call them, slippers, have upper leathers and heels, and are made of softer material. They are worn by horsemen, and for use in the house are frequently brightly colored.¹ It is more than probable that the rawhide sandals with single toe-string came to Latin-America from this region via Spain.

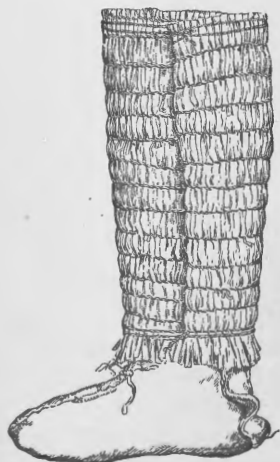


Fig. 37.

LEGGING OF RUSHES IN TWINED WEAVING, KLAMATH INDIANS, NORTHERN CALIFORNIA.

From a figure in Mason's "Ray Collection from the Hupa Reservation," Report of the Smithsonian Institution, 1886.

The legging must next be studied in this connection. It may have a separate existence, as in our modern examples. It may form an elongated portion of the shoe, as in Eskimo boots. It may be attached immediately to a sandal and become a boot, as in northern Japan. It may extend uninterruptedly from a rawhide sole to the hip, being shoe top, boot leg, and breeches, as in the Pueblo country. Finally, shoe, legging, and breeches may be continuous, as in the woman's boots of the Eskimo and the Mackenzie River costumes, or in the modern night drawers of children.

Example No. 24080 in the U. S. National Museum (fig. 37) is a legging worn by a Klamath Indian in California, made of coarse rush and woven together by twined weaving precisely as in the Alaskan grass sock and the Tate Yama boot (fig. 44). The Klamath country as well as the Aleutian Islands having been more or less exposed to Asiatic influences during the past half century it is quite within the possible that both

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¹Tristram, "Eastern Customs in Bible Lands," London, 1894, p. 50.

the socks and the leggings are late acculturations. Omitting this, the reader is left to decide the question of original suggestion in three separate areas.

Examples Nos. 150645 to 150649 are leggings (hose) worn by the Ainos and collected by Romyn Hitchcock. They are made of Japanese white or blue cotton cloth, each embroidered with cotton yarn of the other color. Two pairs are of the oliyo or elm bark (*Ulmus montana*). The ornamentation is produced partly in the weaving with differently colored yarns and partly in the use of the embroidered Cupid's bow or double line of beauty, so marked in all Aino ornaments.¹ It is only one step to the boot. By uniting the legging to the moccasin and sewing the sandal on to the bottom of that, the modern boot is in progress. There is not yet the complete outfit of sole and welt and insole; of vamp and quarters; of heel with a series of lifts; of top and extension top and straps; besides a dozen ornamental parts. But it will be seen that most of these parts, or something more elaborate and quite as effectual, have been thought out by downright savages.

As previously mentioned, the moccasin is of little or no use in a wet country, in bogs, or on the seashore. The high-heeled shoes of actors and of palaces had their origin in a necessity. The aborigines of America above the Arctic circle had recourse to sealskin cured without sweating and fish skin to keep the feet dry. The clumsy sole of the Asiatic Pacific Coast is the result of a struggle in the same direction. But the sabot, the clog, the chopine show how western Europe wrestled with the problem and thousands of persons still find employment in their manufacture. In England, the clog or patten is one step in advance of the sabot. A sole of maple or ash has an upper of leather riveted or nailed on. The survival of the clog is seen in great establishments like tanneries, where it is desirable to keep the feet above wet and muddy floors. Professor Morse draws my attention to the thousand and one styles of stilted sandals or quetta in use among the Japanese, and these point westward to the Caspian drainage for their congeners.

No one fails to remark the extreme roughness on the inside of most primitive foot gear. Now, since the sole of the foot, like the back and the neck of a horse, is the vital point to the footman and the carrier, it is reasonable to suppose that this was an object of constant care. In fact, the foot itself has wonderful adaptedness and the sole of the barefoot man becomes extremely callous. This is nature's contribution. In the U. S. National Museum are wooden sandals adorned on the sole with rows of brass-headed upholsterer's nails and the tough feet of the owners have actually worn furrows in the wood between the nails. But the inventive faculty has not been idle.

The Japanese weave a neat and smooth little insole of rushes or other soft fiber to fit above the regular sole in the common or diagonal

pattern seen in chair bottoms. In a large series of shoes the student gets a good notion of inventive progress through these insole devices and the method of their attachment.

The wearers of sabots are in the habit of eking out the foot by padding of some kind to prevent chafing. In every case the remedy is made effective with the best help of the environment. These devices are provisions simply against hurt or bruises. Temperature is not considered. In most regions under consideration the foot would be injured by bandaging or covering. A little further on it will be seen that packing the foot in soft grass is a provision for warmth and to prevent making that member too delicate. But there is a zone, an isothermal belt, between the complete double boot and the sandal, where the temperature for at least a part of the year is not cold enough for the hyperborean boot and packing, but where it is too cool for the unprotected foot. Here was elaborated the stocking or the double shoe top, or something to keep the foot and lower leg warm. It is interesting to note how exactly elevation above sea level tallies with latitude in determining this special article of dress.

The middle and western Asiatics, for religious and other considerations, holding on to the use of the sandal (easily removed), worked out the mitten sock with divided toes, the regular sock or stocking, and the inshoe or boot, over which the other shoe fitted. One may imagine such people moving northward or higher up and developing the double boot and the overshoe by simply thickening the material or adopting the thicker material supplied by nature.

In Korea, as well as in China, the stocking turns out to be a very complicated affair. A double bag of coarse cotton or other fabric is stuffed with a mass or waste half an inch thick. This is doubtless a luxury for those who do not travel, rendering the foot entirely too tender for work. (Cat. No. 167711, U. S. N. M., from Korea, collected by H. B. Hurlbert.)

The Samoyed men and women both wear the lieup thien, or skin stocking, and the pimmies, or long deerskin boots. The only difference in the latter is that the crossbar is just above the instep in the woman's pimmies and just below the knee in the men's. In wet snow unsweated sealskin pimmies are worn. The Samoyed woman, it is said, is very careful of her husband's skin boots, turning them inside out, hanging them up to dry and putting grass into them in the morning.¹

Eskimo men at Point Barrow, according to Murdoch, wear stockings of deerskin with the hair in. He figures the pattern of this sock, and says that they are made of very thick winter deerskin and substituted for the outer boots when the men are out deer hunting in winter in the dry snow, especially when snowshoes are used.² The same device is to

¹Jackson, "The Great Frozen Land," London, 1895, pp. 27, 64.

²Ninth Ann. Rep. Bureau of Ethnology, p. 129, fig. 74, showing patterns; also F. Nansen, "First Crossing of Greenland," II, p. 275.

be seen in other fur wearing regions, and the selfsame custom projects itself into northwestern Canada, only the buckskin has been tawed. Nansen describes the double sealskin boot of the Greenland Eskimo.

The Eskimo also have a fashion of placing little bundles of dried fiber or fur in the boots, especially where the foot is chafed.

The East Greenland Eskimo use grass in their shoes, according to Nansen. He gives an amusing account of this in speaking of his Lapp companions, Balto and Ravna, who had the selfsame custom.¹

The straw socks in the national collection (Nelson, No. 49082-'3) are said by him to be made along the lower Yukon and adjacent tundra to the south, perhaps to the Kuskokwim. Unalet name, Athl uk shat.

Example No. 8784 is a pair of grass socks worn by the Premorska Indians of Alaska, collected by William H. Dall. They are regularly constructed by process of twined weaving; the warp is vertical, and the stocking is made to fit the foot by the insertion of extra-warped threads where they are needed. Beginning at the middle of the sole a series of twined weavings proceeds in a spiral around the bottom and the top of the foot for about an inch, when the lines begin to extend from the heel over the top of the instep. Separate lines of weaving are inserted across the back of the foot between the toes and the instep. This kind of weaving is very common all over the world, but its particular application to foot gear should be compared with No. 73091 from Tate Yama, Japan (fig. 44). Length of foot, 10½ inches. Precisely similar weaving is to be seen on the numerous grass wallets collected at St. Michaels.

STOCKINGS IN THE U. S. NATIONAL MUSEUM.

Museum number.	Specimen.	Locality.	By whom contributed.
49200	Socks (odd)	Alaska	E. W. Nelson.
48696	Socks, straw	Sabotnisky, Alaska	Do.
38813, 38814	Socks (or shoes), straw	Lower Kuskoquim	Do.
55972	Socks, woven grass	Bristol Bay, Alaska	Charles L. McKay.
1693	Socks, fox skin	Anderson River	R. Mac Farlane.
68143	Socks, child's	Hudson Bay, Eskimo	J. T. Brown.
5136	Socks, man's deerskin	Mackenzie River	R. Mac Farlane.
70999	Socks or shoe (Moki)	Arizona	Maj. J. W. Powell.
153045	Stockings, woolen	Persia	Pinkas Hanuka.
76386	.....do .....	.....do	Otis Bigelow.
164943	Socks, leather, worn with chaplies	Kashmir, India	Dr. W. L. Abbott.
167711	Socks, child's	Korea	H. B. Hurlbert.
151396	.....do	Wenchow, China	Dr. D. J. McGowan.
126875	Stockings	China	Miss Dollie Leech.
55826	Socks, felt, for women	Manchuria, China	Chinese Centennial Commission.
49082, 49083	Socks, straw	Lower Yukon, Alaska	E. W. Nelson.
49199	Socks, grass	Alaska	Do.
8784	.....do	Premorska Indians	W. H. Dall.

¹ F. Nansen, "First Crossing of Greenland," London, 1890, 1, p. 362.

The interoceanic area, with its Australian, Negroid, Polynesian, and Malay peoples, is par excellence the barefooted region. On the shore the wet sands would render any foot clothing for which nature there furnishes material very uncomfortable. Life in the boat or canoe and in the shallow waters creates no demand for shoes. In recent pictures of the Malagasy army the soldiers are barefooted. These islands are volcanic and the coasts are lined with coral reefs. For walking over the one or for fishing along the other, some protection is necessary. The Polynesians, therefore, wore a tufted sandal of bast of the *Hibiscus*¹ in fishing on the coral reefs (fig. 38). Or, as in example No. 92884 in the National Museum, from the Sandwich Islands, leaves of pandanus are braided into a poor sandal for walking over the warm slag. The thick butt ends of the leaves are imbricated under the soles so as to leave quite a thick pad between the feet and the rough, hot ground.

Example No. 130639 is a sandal from New Zealand made of cordyline fiber, and consists of three pieces—the sole, the selvage or series of loops extending quite around the sole, and the lacing. The sole is of very coarse fiber, woven in diaper pattern diagonally. The selvage consists of a coarse vine fastened at the heel, and at intervals of 3 inches looped into the edge of the sole. Along the margin a small vine is carried and tied to the joints of this selvage by a clove hitch at each junction with the sole, and the lacing passes backward and forward across the

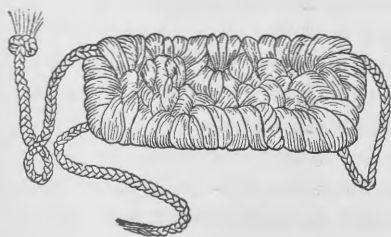


Fig. 38.

SANDAL OF BAST OF HIBISCUS FROM SAMOA.

From a figure in Ratzel's "Völkerkunde."

foot, and around the heel through these selvage loops. The heel is made by a series of bands of very coarse fiber, passing backward and forward from one selvage loop to another, and tied with a single knot at each turn.

The noticeable points in this specimen are the diaper weaving, the complicated selvage, and the curiously built-up heel. This specimen must have belonged to a very large man (fig. 39). Length, 13 inches. Collected by the Royal Gardens of Kew, England.

This type of sandal exists elsewhere, and it must not be understood that it is a native New Zealand product. The absence of the string or strap between the first and the second toe will help to suggest certain culture centers from which it was not derived. In Korea and among the Ainos it is found, especially the border loops for the lacing. But an interesting similarity will be noted between this specimen and the figure of a cliff-dweller's sandal drawn by Nordenskiöld.²

¹ Figured by Ratzel in "Völkerkunde," II, p. 165.

² Cf. Hildebrandt, Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1890, pl. xcvi. Wiener does not figure anything of the kind in "Pérou et Bolivie."

Example No. 130640 is a pair of very primitive sandals of taromba spathe (*Arenga saccharifera*) from Borneo. The strings are made of the bast of the timbarua tree. This is the simplest form of shoe that can possibly be constructed. A bit of the spathe of the arenga is cut out in form of the foot, one hole is bored at the toe and two under the heel. A bit of twisted bast of the artocarpus is knotted and drawn through the front so as to pass between the toes, after the manner of the Caucasian or Mediterranean stocks or the Japanese; this is the lacing. Another bit of the same material doubled passes through the two holes under the heel to form loops. The lacing passes between the toes, across the back of the foot to the loop on the outside, around the heel through the loop on the inside, and across the instep to be fastened. Length, 11 inches. Collected by Royal Gardens of Kew, England.

In tropical America below the Piedmont regions, that is in the eastern portions and on the lowlands, the aborigines were barefooted. Indeed, though the question of origin is not here at all discussed, it will be further seen when the shod American is studied that it is very difficult nowadays to distinguish the New World from the Old World sandal in that area. Looking through such careful works as Von den Steinen's one sees no picture of foot gear and no allusion to it in the index.¹

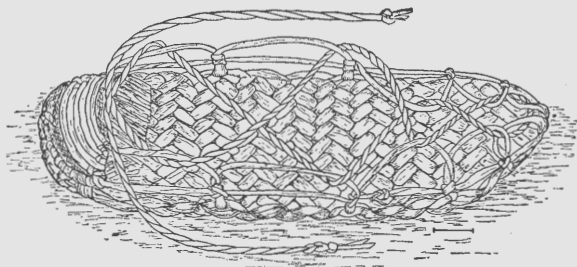


Fig. 39.

SANDAL OF CORDYLIN FIBER FROM NEW ZEALAND.

Cat. No. 130639, U. S. N. M. Collected by the Royal Botanic Gardens, Kew, England.

What has been said concerning the Indo-Pacific peoples and America may be repeated of negroid Africa, that is the part south of the Sahara. There is no climatic reason for shoes, the country is not volcanic, and the noxious animals are less able to injure the unclothed foot. There is an enormous amount of going about and of trading along beaten and cleared paths, hundreds of thousands of natives are all the time tramping to the trading center and to the coast, and yet we are told that they never cover the feet. In all books of travels and in photographs the natives are represented barefooted. This has given rise in Africa, and in Borneo as well, to a peculiar weapon, the foot-path splinter, small splints of cane sharpened, cut nearly in two, and stuck in the trail or public highway, a kind of aboriginal caltrop. The U. S. National Museum, though well supplied with African material and specially rich in foot wear, is extremely poor in examples from negroid Africa. An interest-

¹ "Unter den Naturvölkern Zentral-Brasiliens," Berlin, 1894.

ing chapter could be written on the deformations produced by cramping the foot of the African into white men's shoes.

The Hottentots, according to Ratzel, wear sandals of woven filaments and of rawhide. In the former the toes pass under a looped cord which extends up the middle of the instep, is knotted at the ankle, and fastened down at either side of the heel. In the rawhide specimens there is in addition a separate heel piece.¹

Weiss's "Kostumkunde" figures a Hottentot sandal made of a piece of hide drawn up about the side of the foot and laced. He quotes Neibuhr on the Arab practice of cutting up the hide of a dead donkey on the road for sandals. Two Arab figures of Weiss's have loops or inclosures for one or more toes (fig. 101, *d* and *e*). This last has (1) quadrilateral sole, sewed with single thong; (2) heel strap separate, sloping up from sole; (3) instep band; (4) toe band, across all toes; (5) toe strings, inclosing three middle toes and running back to (3) to be tied. Feature 5 has some resemblance to Central American types.

When the Hottentots drive their herds to pasture, says Kolben, they put on a kind of leather stocking to secure their legs from being scratched by briars, etc. When they are to pass over rocks and sand, they put on a kind of sandal cut out of the rawhide of an ox or elephant, each consisting of only one piece, turning up about half an inch all around the foot, with the hairy side out, and fastened on with strings.² Nothing could be simpler to protect the sole of the foot. Aboriginal peoples, having access to animals with thick skins, naturally resort to this simple device of a bit of pelt cut larger than the foot, and while green or soaked turned up around the edge of the sole. This method of constructing a shoe or boot sole will appear again away up in the higher grades of the art. This specimen must be compared with a South American example further on.

Ratzel also figures a sandal from Unyoro, after Baker, somewhat dish-shaped, in which there is no distinction of sole and upper, and yet the material rises well up about the sole of the foot and above it for nearly an inch.³ The sandals of this type are held onto the foot by the rudest kind of lacing, generally rove backward and forward through gashes cut in the upper margin. As the Sandwich Island sandal is among the rudest of vegetal foot gear, this type ranks lowest among those made of skin. Similar sandals are worn on the high plateaus of Peru made from the skin of the llama or of coarse vegetable fiber (fig. 40).⁴

Sir Samuel Baker figures a Unyoro sandal of rawhide. It is a shallow tray or dish, into which the foot is fitted. A strap loop in front fits the great toe; at the sides, on the margins, under the ankle bones

¹ Ratzel, "Völkerkunde," Leipzig, 1887, I, p. 91, four figures.

² Kolben, "Voyage to Cape Good Hope," IV, p. 14.

³ Ratzel, "Völkerkunde," Leipzig, 1887, I, p. 65.

⁴ Wiener, "Pérou et Bolivie," p. 679.

there are projections upward, slashed for the reception of a thong or lacing that passes over the instep and backward over the heel.

In central Soudan, Kanembu and Manga warriors wear sandals made of a sole of hide fastened on by a thong passing between the toes straight back to the ankle, where it meets a thong passing around the ankle and down to the sole at the arch, as in a spur. Indeed, the whole fastening is one continuous thong. This variety adds the toe strap, so common in all lands immediately or remotely touched by Caucasian influence. This feature will be noted further on.

Ratzel figures examples made from leather among the Herero. The type has toe strap extended and looped behind the ankle and attached to two side straps.¹ The specimens figured are quite ornate, and belong rather to social life than to the road. The characteristics also are from a region farther north.

Example No. 72716 is a low shoe from Morocco. The sole is of raw-hide, curved up, and formed while wet so as to fit around the margin of the foot and over the toes, where the two edges are united to form a point decorated with an insertion of red morocco. The narrow upper margin, of black leather, is sewed on all around and doubled under at the edge. The string or strap passes through slashing in the heel and at the sides of the ankle. The noticeable features are the sole made of one piece and the simple manner in which the pointed toe is formed. Length, 10 inches.

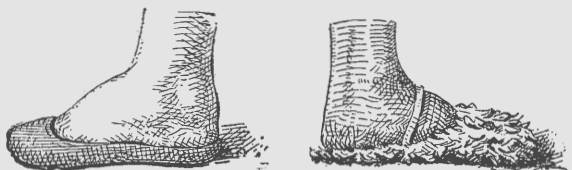


Fig. 40.

PERUVIAN SANDALS OF LLAMA HIDE AND TEXTILES, FROM ANCON AND PARAMONGA.

From a figure in Wiener's "Pérou et Bolivie."

Example No. 72716 is a shoe from Morocco, the gift of the Museum für Völkerkunde, Leipzig. It is made of light-brown leather, which has been stretched over a last when wet and permitted to dry into shape. The toes are pointed, and into them are inserted strips of red leather bound with black. They are secured to the foot by a leather thong, which ties across the instep. Length, 9 $\frac{3}{4}$ inches. The pointed toe is ornamental and leads away from the road. Its distribution in time and place is not difficult to trace.

The Mohammedan influence in west Soudan, added to the North African propensity for fine leather, is expressed in embossed and bedecked slippers. Symmetry overcomes the desire to follow the shape of the foot. The toe strap is attached to cross straps rising from the arch of the foot. There are no heel straps, and the sandal has only a slipshod attachment to the foot.² The stilt sandal, with toe peg, exists among

¹Ratzel, "Völkerkunde," Leipzig, 1887, I, p. 328.

²Museum für Völkerkunde, Berlin. Figured by Ratzel, *Ibid.*, III, pp. 187, 277.

the Mandingos, but is useless for traveling purposes and came with the Mohammedans.

Example No. 43073 is a pair of sandals from Monrovia, Liberia, constructed on the plan of shoes generally worn in Mohammedan countries. Several thicknesses of leather are sewed together with a single thong in the form of stitch called "running." A small string passes up through the front and is connected with the lacing, which passes between the toes. The shoe is held in place by broad bands attached to the sole under the heel, and crossing each other on the back of the foot. A large button or rosette is placed on top of the foot below the instep. The surface of this rosette consists of diagonal weaving of red and black leather and palm leaf in very pretty geometric patterns. Length, $9\frac{3}{4}$ inches. Collected by J. H. Smyth, United States minister.

Mr. L. M. McCormick purchased at a bazaar in Aden a pair of sandals which show little or no signs of wear (example No. 175228 in the National Museum). The soles are quadrilateral, of two thicknesses of old leather, the lower much tougher. Under the heel of each is an additional piece, wedge-shaped; and between the soles an old sole for packing. These soles are sewed together by thongs of leather, making short stitches on top and long stitches underneath, about the margin and halfway down the middle. So much for the soles.

There are four parts connected with the lacing, which may be called (1) the toe string, (2) the buckle, (3) the heel strap, and (4) the lacing. The toe strap, or string, passes through two slits in the upper sole, so as to go between toes 1 and 2 and 3 and 4, and the two ends are then drawn up through separate slits in the leather buckle, tied in a single knot, and laid down flat. The buckle, so called, is a quadrilateral piece of leather, having two narrow slits for the ends of the toe string and two wider ones for the lacing. This buckle lies on the top of the foot below the instep.

The heel strap is of the very common sort, a strip of leather nearly an inch wide, passing through two slits on the margins of the upper sole. Its ends stand up an inch or more, and have double slits or slashes for the lacing.

The lacing is interesting (1) for its function in the "buckle," to hold the toe string in place and for the deft way in which the ends of the toe strings are tucked under, and (2) for the knots in the lugs or ends of the heel strap made on one side by a double loop in the lacing rove through the slits, and for the other side by the tucking in of the ends, which can be shown only by a drawing.

Example No. 175227 is a pair of sandals without location, consisting of compound soles, toe strings, toe loop, instep band, and side straps at the arch of the foot, besides a variety of ornamentations. As the sandal furnishes a type, it may be more minutely described:

(1) The sole in its top layer is complete, the next layer reaches from the heel nearly to the tip, the next two are complete, and they finish

the upper series. The heel is cut like that of a modern shoe. Under the ankles two broad side straps extend outward for purposes of lashing. The front portion widens out very broad, and the specimens are rights and lefts.

(2) Beneath this series is another, of the same dimensions at the heel, receding half an inch under the front of the foot. The heel has two or three extra layers, but there has been some patching.

(3) The ankle pieces extending from the sole are double on either side, and a double ankle band, the upper layer cut and stamped into lace work, is sewed by its ends between the ankle pieces.

(4) The toe fastenings are noteworthy, consisting of a loop for the great toe, and triple or double toe strings between 1 and 2 and 4 and 5.

These toe strings are gathered between the instep band by means of strings having false buttons of leather decorated with brass. The sewing is done in the universal southern Asiatic fashion by punching holes and reeving a leather thong through them, making neat stitches above and long ones beneath. In the *English Illustrated Magazine* for October, 1895, page 83, may be seen a Somali man wearing the peculiar, heavy, thick soled, curved sandals, with the curious side-boards visible on the feet of some Assyrian sculptures. On page 85 a queer looking lot of boys are similarly set out. In riding, the men use a rawhide loop for stirrups.

"In Egypt," says Erman, "men and women, young and old, almost always went barefoot, even when wearing the richest costumes. Under the old and the middle empire women seem never to have worn sandals, while great men probably only used them when they were needed out of doors, and even then they generally gave them to be carried by the sandal bearer who followed them. Sandals were more frequently used under the new empire; still they were not quite naturalized, and custom forbade that they be worn in presence of a superior. Consequently sandals were all essentially of the same form. Those here represented have soles of leather, of papyrus, reed, or palm bast; the two straps are of the same material, one strap passes over the instep, the other between the toes. Sometimes a third strap is put behind round the heel in order to hold the sandals on better; sometimes the front of the sandal is turned over as a protection to the toes. The sandal with sides belongs to a later period."¹

The Egyptian sandals in the Metropolitan Museum, New York, are of the following kinds:

1. No. 351, center of sole of leather bordered with rows of coiled weaving in vegetal fiber; toe string of vegetal fiber.

2. No. 298 is woven, warp transverse, the texture resembling the coiled basketry of the Interior Basin of the United States, wherein the filaments split through one another; the border consists of two rows of coil; toe string of fiber, knotted underneath.

¹ Erman, "Life in Ancient Egypt," London, 1894, pp. 226-228, with ten figures in the text.

In the Douglas Egyptian collection of the same museum, one example is woven diagonally of papyrus, but has a sewed border; there is a hole for the toe string. One pair has wooden soles, one-eighth inch thick, holes for toe strings, and little posts or standards of wood beneath the ankle; the lacing passes from the toe string across the top of the foot to these posts. In drawings little curtains of ornamental stuff depend from the lacings. These sandals are not for the road. No. 45 in the Douglas collection has a strongly turned-up toe, pointed, the continued point meeting the toe string; a side, or vamp and quarter in one, extends from the toe quite around, inclosing the foot; the inside is lined with diagonally woven matting. These shoes resemble many Chinese examples.¹

The sandal on the statue of Rameses II, in Turin, has a flat sole, toe string between 1 and 2, going straight up the top of the foot to a much-raised instep band reaching up from the sole under the heel. Other examples much turned up after the manner of the Somali type in front have the same elements with decorated instep band. Weiss² figures the greatest variety in this instep piece. There are practically five types of Egyptian shoe according to this author:

- (1) Sole, toe string, instep strap.
- (2) Sole of vegetal fiber, toe string bifurcated, instep strap.
- (3) Toe strap, ankle band, vertical side straps.
- (4) Wooden soles, ankle posts, ankle band sloping downward to the top of the post, and toe string passing to ankle band in two parts, from which hang curtains.
- (5) Double sole, curled toe, toe strap, instep strap. From the instep strap to the toe, as in a Canadian toboggan, a curtain hangs down the sides.³

The ancient Hebrew wore a sandal with sole of leather, felt, cloth, or wood, occasionally shod with iron. From a passage in the Mishna it would seem that a heel strap was used in addition to the lacing [latchet] (Jebam., XII, 1). In accordance with the general statement that the shoe is an implement of travel, the Hebrews wore the sandal chiefly on the road. It was the Gibeonites who used the condition of their footwear as an indicator of distance traveled, "Our shoes have become old by reason of the very long journey" (Joshua IX, 13).

The modern Semito-Hamite pays great attention to the sandal and the shoe. The Hittite statue at Jerabis has on its feet boots, the sole

¹ The modern Egyptians wear red and yellow Turkish shoes; red outer shoes, *murkoo'b*; inner yellow shoes, *mezz*. The former are worn slipshod, and taken off upon stepping on a carpet or rug. (Lane, "Modern Egyptians," London, 1846, I, p. 44.)

² "Kostümkunde," Stuttgart, 1860, 2 vols. For the many ways in which ankle band may become heel and instep band by having its ankle parts elongated and drawn down to the sole, cf. Erman, "Ægypt," Tübingen, 1885, pp. 138, 159, and elsewhere.

³ Weiss, "Kostümkunde," I, p. 37.

stopping under the ball of the foot. There is a distinct quarter over the heel and a top reaching up and constructed much as in the Athapascan moccasin.¹

In the U. S. National Museum there is an interesting pair of sandals (example No. 5499), which have been in its possession a great many years. The locality given is Arabia, but many of the older numbers of the collection are not absolutely reliable. The notable features are the sole, the lacing, and the ornamentation. The sole consists of four thicknesses of leather, the middle one being the thickest. These are sewed together by means of a leather thong passing backward and forward, so as to make the alternation of stitches and vacant spaces quite regular around the upper border. No care is bestowed upon the bottom in this particular. This form of sewing or running bits of leather together is a type to be observed. The lacing is thus applied: the toe strap consists of three thicknesses which pass down through the sole and are fastened off below. Two of these thicknesses serve this function and no other. The third strap passes up between the toes, turns to the outer side of the foot, is attached to a loop or lug on the side by a single half hitch, passes across the instep down to a lug on the opposite side where it is again fastened, and then up over the side of the foot above the great toe, where it passes through the three thicknesses of leather and is fastened off by a sort of Turk's-head knot. The ornamentation consists of diagonal patterns and lines in white and green leather formed by sewing or back-stitching with a very narrow thin filament or thong of leather. The top of the sole, a broad band going across the foot, and a little narrow tongue of white, green, and brown leather on the instep over the lacing are all decorated after this fashion. Length, 10 inches.

Bare feet are very common in Chaldean and Assyrian sculptures, but foot gear is not uncommon. Boottees, high shoes, a little difficult to make out, and sandals with borders turned up, are worn in processions and about the royal palace.²

Assyrian sandals shown in sculptures have (1) sole of leather, single or double, flat generally; (2) heel inclosed by "quarter" piece, sloping down frontward; (3) cross straps and lacings from the quarter piece over the back of the foot and to the margins frontward; (4) loop over great toe, alone or attached to lacing.

Three kinds of foot gear are shown at Khorsabad. Two of them are sandals and one is a laced boot. In one form of sandal the heel and plantar arch are closed in, the instep and toes are bare, and three straps or three turns of a lacing connect the heel piece or low quarter across the instep. In the second sandal this heel is prolonged forward. The toes are strapped down and lacings pass across the metatarsals and over the instep. The laced boot has a sole curved up all round like

¹ William Wright, "Empire of the Hittites," New York, 1884, pls. I, II.

² Perrot et Chipiez, "Chaldea," London, 1884, II.

that of a Canadian lumberman and the top is sewed to this and laced all the way up the front. The Eskimo boots and the lauparsko of the Lapps are on the same model.

The Assyrian of high rank wore a sandal with sole of wood or thick leather. The upper consisted of a heel piece, sloping forward and reaching to the ball of the foot, where it runs out and leaves the toes and back of the foot uncovered. Lugs, or eyelets, on the margin of this piece served for lacing, passing two or more times over the instep. The lacing also crossed on the instep, and was passed round the great toe and between it and the adjoining toe.

For the common people the sandal was a sole, with a sloping heel band extending to the ball of the foot, laced over the instep with a thong passing through eyelets. Between the lacing and the instep a pad was held in place by the lacing running through slashes in the pad. This kind of sandal, reaching only to the toes and held on by a heel band, occurs in hundreds of figures in the Mexican codices. It is a little difficult to understand how a bare foot would be benefited by such gear. In the finest American snowshoes the open space in the netting for the accommodation of the toes also suggests itself. Layard also tells us that the enemies of the Assyrians differ from them in foot gear. On some feet the sole is attached by bands passing over the instep and around the heel. In other examples there seems to be a sole turned up and the upper rim united by crossbands, the upper part being left exposed.

The warriors' boots in the Khorsabad sculptures are not so difficult to comprehend. The sole was turned up all around the margin, the vamp and legging were, perhaps, in one piece, and sewed to the sole. The legging was doubtless open in front, as may be seen in a great many northern examples in our day.¹ See figure boot of the Tate Yama hunter. Mr. Rockhill brought from Tibet a long scroll, covered with painting of the various western barbarous nations coming to pay their tribute to the Emperor of China. The foot wear in most of them agrees with the specimens brought home by him. The primitive efforts at boot making with the toe well curved up and the typical Turkish slipper predominate.

The Assyrian sandal shown in the bas-reliefs has a leather sole of several thicknesses sewed together. The toe string passes between 1 and 2, is bifurcated and reaches the margin of the sole under the arch of the foot, as in the Japanese sandal. There is also a band across all toes well in front, in a side view seeming to be looped only over the first toe. Frequently the heel cover is a solid leather quarter sloping forward and giving out at the margin under the ball of the foot.

In the Cesnola collection, Metropolitan Museum, New York City, several pieces of pottery from Cyprus show the boot or shoe form, or

¹ Cf. Layard, "Nineveh and its Remains," New York, 1849, II. See figure opposite p. 236.

the ornamented moccasin. In one or two examples the toe string between 1 and 2, and the additional band across all toes appear.

Some idea of the foot gear of the Caucasian in his ancient culture may be gained from carvings and sculptures or monuments and from ornaments on vases. The lesson is the same. The soldier is shod, for he is the man of the road, and whether he is portrayed in combat or idealized in sculpture or apotheosized in temple adornment, he knows no holy ground where he must take the shoes from off his feet. A modern officer of high rank when borne to his grave, accompanied by his horse, has the boots still attached to the stirrups.

The Greek *κρηπίς*, Latin *crepida*, occupied a middle position between a closed boot and a plain sandal. Its simplest form was a high and strong sole often studded with nails. Other forms had a low upper creeping up over the foot and becoming a shoe. In the dramatic costumes the *κρηπίς* assumed the form of a soft shoe worn by women.¹ The *crepida* belonged to working people and soldiers, chiefs among roadsters. About the heel there was a series of loops into which the thong was laced across the top of the foot and through the toe strap. One form of Assyrian sandal has the same suggestion of an upper.

The Roman *sandalium*—*βλάβυται* or *σανδάλιον* in Greek—were originally wooden soles secured to the feet with thongs. During the Homeric age they were worn only by women; later in Italy and in Greece they were used by both sexes. *Solea* was the military sandal. A sandal with a leather toe piece, *ὑπόδημα*, was the ancestor of the now universal sandal of the world. By a regular transition the lower form became the shoe, *calceus*. Indeed, the last term covers *ὑπόδημα*, the laced sandal, shoes, and boots.

The *baxea* of the Romans were sandals made of vegetable leaves, stems, twigs, or fibers. The figures in Smith show both plain and wicker weaving.² In both examples there is the toe strap between the first and the second toe, a selvage border more closely plaited, and the two varieties of sharp toe and round toe that have divided shoes and snowshoes into two opposite camps always and everywhere. No heel strap appears on these simple devices, and they evidently take their places in the class with the heelless slipper.

In a work published in Amsterdam in 1667, entitled "Balduinus de Calceo Antiquo et Negronius de Caliga Veterum," the following styles of sandals are figured:

(1) A scoop-shaped piece of leather, extending under the foot to the ball and up the sides and about the heel an inch or so, is abruptly cut off, leaving the toes free as on a moccasin snowshoe. Loops pass from side to side across the top of the foot.

(2) A stiff sole fitting the foot has four lugs or loops on the margin, two opposite the toe joints, the others under the instep; a single lace is used.

¹ Smith, Dictionary of Antiquities, s. v. "*Crepida*," with figure.

² *Ibid.*, s. v. "*Baxea*."

(3) A flat sole, with one or two bands across the foot at right angles to its axis. Under soles of this pattern blocks of wood and stilted appliances are put.

(4) A sole, with toe string between the first and second toe. On reaching the top of the foot this toe string is variously treated (*a*), splitting and proceeding over the foot to the margin of the sole under the instep, Japanese fashion; (*b*) going straight to the ankle band; (*c*) becoming part of straight across lacing. In a Roman sandal on the Arch of Constantine the toe string does both, splits and passes to the margin, and by another branch passes straight to the ankle band, locking with all crossbands on its way. On Trajan's Column both kinds are shown, with toe string and without it.¹

Examples of medieval shoes are in the Baker collection, Metropolitan Museum, New York. The slipshod and the plain low shoe are affairs of fashion, however, and the ancient forms held the road till much later.

Example No. 130835 (fig. 41) is an Afghan sandal, consisting of the

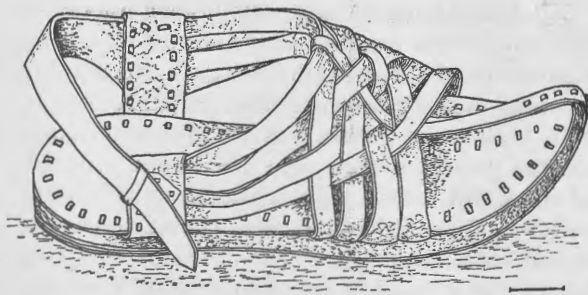


Fig. 41.

LACED SANDAL OF LEATHER FROM AFGHANISTAN.

Cat. No. 130835, U. S. N. M. Gift of Barnet Phillips.

sole and the upper lacing. The sole is built up of three thicknesses of leather, that is, a heavy, coarse strip lined above and below with thin leather. At the heel two additional thicknesses of the thin leather are added below. These are all sewed

together by three lines of stitching, in which the sewing is done, not with thread, but with a string of leather one-eighth of an inch wide, passing through the three soles backward and forward in what is called a running stitch.

The upper part or lacing is thus effected; a strip of leather 2 inches wide is sewed in with the parts of the sole on both sides of the ball of the foot, these are then slit into four divisions or ribbons, braided together by a four-ply braid to go across the back of the foot. The ends are then gathered up and sewed into the upright ankle straps, which were also attached to the soles when they were sewed together. Between the two upright ankle straps a horizontal strap is carried back of the heel and buckled into the one on the other side. The toe is pointed, and from this point a narrow loop of leather is carried backward over the back of the foot and woven in strips before mentioned.

¹Graig, "Old-fashioned Shoes," Edinburgh, 1889, pls. XVI, XVII.

This peculiar attachment of strings running from the point of the toe should be compared with the similar feature of some Oriental sandals. Length, 10½ inches. Gift of Barnet Phillips.

In many western Asiatic pictures on stone and pottery and paper the men are wearing buskins or a kind of moccasin of greater or less height and thickness.

Example No. 153347 is a pair of sandals called *ciapal*, from Singapore. This is an ornamental shoe, the parts fastened together with rivets. The upper part, however, preserves the band between the toes made of a cord bound with red morocco and sewed.

An interesting feature of this example is the fact that in the construction of the modern complex sole the shoemaker, instead of carrying his knot of the toe strap down through the sole and fastening it off under the bottom has brought it partly through the sole and out again on top to form an ornament. It might be well to remember this characteristic in accounting for the long-toed shoes worn extensively in medieval times. Length, 9½ inches. Collected by Hon. Rounseville Wildman. The common sandal of India consists of (1) a leather sole of more than one layer, sewed with a single thong; (2) the single toe string; (3) instep band, meeting the toe string on the back of the foot, the joint covered with large rosette. The elevated wooden sandal, with toe peg or knob, carved and inlaid, is here also perhaps under Mohammedan or Aryan influence.

In the U. S. National Museum there are a pair of chaplies or sandals worn in Kashmir, India, No. 164944. They are said by Dr. W. L. Abbott to be exceedingly comfortable. They consist of the sole, the toe strap, the upper and the heel strap, similar to No. 130835. A stocking or sock of soft leather is worn with these sandals; it is made of soft dressed sheepskin, and has two nearly equal divisions in front for the toes. The sole is a separate piece of leather. The vamp and the quarters are sewed on to the sole as in a European shoe. The divided toe is to be compared with the Japanese type. Dr. Abbott says that the socks are generally used without the split toes, and the brass eyelets or grommets are inserted for the lacing. This last should be regarded as a European production. It is an Aryan type of shoe, and it reminds one of the form in vogue in Europe. Length, 12½ inches. Gift of Dr. W. L. Abbott. In Dr. Abbott's collection the moccasin-like sole with puckered margin is common on boots. The Museum is further indebted to Dr. Abbott for a pair of woman's low boots from Leh Ladak, No. 175104, woolen throughout, in many colors and patches, toes turned up and pointed; a pair of children's pabboos, same materials and style, No. 175105; boots or *chirroks* from Yarkand and worn by both sexes, No. 175118. These last have white leather soles turned up two inches, the long, brown legs are inserted and blind stitched to the sole. There is a loop on the back of the sole for a lacing. The leg and sole unite without intervention of an upper. From Baltistan Dr. Abbott sends

boots of like type but wretchedly made with leather soles patched and coarsely puckered, the tops being of the coarsest kind of woolen fabric, No. 164978.

The chapli, or shoe of Bombay, is a mitten for the foot, having a separate stall for the first toe. This shoe exists as a stocking in the Himalayas and the Kashmir and also in Japan, where the sandal with toe string demands such inside wear.

Example No. 16695 is a leather shoe worn by the Telugus, in southern India, consisting of three layers of very coarse leather sewed together with a white leather thong in the same stitch as most of the examples from this region. The great toe is inclosed in a separate loop. Two small straps pass from the front backward between toes 1-2 and 4-5, and a broad band is attached to the sole on either side of the arch of the foot and passes over the instep; the two narrow straps from the front are inserted through this band. This is a very coarse piece of work.

Length, $8\frac{1}{2}$ inches. In this connection it should be noted that in the sandals from East Africa there are two toe straps, one between the first and second toe and one between the fourth and fifth.

The collections of Hon. W. W. Rockhill in the U. S. National Museum admirably show some of the transitions of the Tibetan foot wear. In the rudest form there is a clumsy combination of the turned-up and puckered sole with the vamp, just as in the Eskimo sealskin boot. Above the vamp is the boot leg with fore and hind seam and any number of transverse seams. This part is coarsely lined with woolen cloth.

The Koko Nor boot, on the contrary, proceeds upon another plan. Coarsely it is a



Fig. 42.

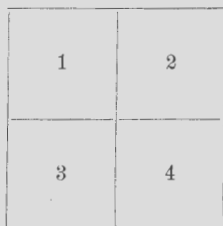
KOKO NOR BOOT.

Cat. No. 131072, U. S. N. M. Collected by W. W. Rockhill.

boot in all essential points, in fact a Chinese shoe with thicker soles and leather top and an additional sole of leather beneath (fig. 42). This type may be seen in various parts of the Chinese Empire and represents the climax of the art there.

Other specimens in this same collection are worthy of study. Example No. 167179, No. 5 in Rockhill's plate in his "Mongolia and Tibet," page 14, is a llama boot with top of red russian leather stamped with small checkerwork. Only one seam, and that in the back; but on one side of the front half a vamp is inserted, making a seam on top of the foot and down diagonally on one side. The toe is the regular Chinese form, with projection. To unite this top with the sole the lower edge of the top is bound with a strip of green leather, like a welt, only the margin turns out instead of in. The sole consists of two parts, a thick upper layer of felted yak hair quilted together an inch thick and bound also

EXPLANATION OF PLATE 2.



BOOTS OF TIBET AND NEIGHBORING REGIONS.

In examples brought to the United States National Museum by Mr. W. W. Rockhill and Dr. W. L. Abbott are to be studied the endeavors of the bootmaker to secure warmth, protection, and durability in relation to environment. The Chinese compound and padded sole, the hyperborean turned up and puckered sole, the uppers of cloth, felt, and leather, the legs with several tops, and the garters are in great variety. Some elements are original, some Siberian, and others are derived from China, Mongolia, and from Turkestan.

Fig. 1. TIBETAN BOOT AND GARTER. Sole of stiff, white yak leather, turned up all around as in Siberian and Eskimo boots and puckered very little. Upper of several thicknesses of white cotton cloth, closely quilted together and attached to the sole by running stitches, short on the outer side and long on the inside. There are three parts to the leg; one of very coarse, garnet, woolen cloth called "truk;" one, of gaudy striped flannel; and the other, of blue cotton cloth. Continuous with a gore in front of the upper, there is an opening along these three tops, and into this is inserted an ornamental stripe of different-colored woolen stuffs. Lining, of very coarse woolen cloth, woven diagonally. Length 10 inches. Collected by W. W. Rockhill.

(Cat. No. 131045, U. S. N. M.)

Fig. 2. TIBETAN BOOT AND GARTER. Similar in design to the specimen shown in fig. 1, with sole of white yak hide whipped on to the upper, which is of black leather run on to the woolen top. In this specimen also is a series of tops in different colors, with insertion or embroidery worked into the slit in front of the leg and upper. Length 10 inches. Collected by W. W. Rockhill.

(Cat. No. 131045 (a), U. S. N. M.)

Fig. 3. TIBETAN BOOT. Made of cowhide, after the Chinese pattern. Sole, of several thicknesses, attached by an ingenious sort of welt which is sewed to the upper and joined to the under layers by another row of sewing deeper in. The parts are generally fastened together at the heel and front by enormous nails which are clinched on the inside. The upper is attached to the leg by a double piping of leather between them. In the seam that extends from the front of the toe, far up on the leg, occurs also a double piping, and the edges of the leather are turned outward in the seam. Worn on the borders of Koko Nor. Length 11 inches. Collected by W. W. Rockhill.

(Cat. No. 131072, U. S. N. M.)

FIG. 4. TIBETAN BOOT.—SIBERIAN TYPE. The sole is of yak rawhide with the hair on. It is turned up and slightly puckered, pointed and bossed in front. The upper is of dressed leather and fitted inside the margin of the sole and attached by blind stitching. The leg consists of three tops; the first is of yellow leather fitted inside the upper and backstitched; the second is of light-brown leather, inserted inside the first, and sewed over and over; the third is of coarse leather with the flesh side out. The upper and all of the tops are split for the insertion of several narrow bands or pipings of colored leather. In this regard the specimen should be compared with many beautiful examples from Alaska, secured by E. W. Nelson. One of these is mentioned on page 340 (Cat. No. 43345). The lining is of coarse woolen cloth. Collected by W. W. Rockhill.

(Cat. No. 167363, U. S. N. M.)



BOOTS OF TIBET AND NEIGHBORING REGIONS.

Rockhill, "Notes on the Ethnology of Tibet," Pl. 2, Report of the Smithsonian Institution (U. S. National Museum), 1893.

about the margin with green leather. The under sole is a thick piece of hard leather, attached to the upper sole and the top by a stitching of stout twine that passes down through all and back, holding the parts together. The ornamentation is worked on the surface in various colors of narrow silk braid. There does not seem to be any originality in the Tibetan foot clothing. Here Mongol elements obtrude; there Chinese and frequently Russian influence obscures all the others. One may see in Lapland and Finland characteristics of boots suggestive of Tibet, and again among the Eskimo other marks call them to mind. As this desert land can not have been the prolific source of cultures, it must be the desolate suburb into which they have been driven.

Example No. 131045 is a pair of Tibetan boots (pl. 2, fig. 1). The sole is white yak rawhide, puckered as in the Eskimo boot. The upper consists of two pieces of white cotten cloth doubled several times, united at the toe and at the heel, about $2\frac{1}{2}$ inches high. On the top of this upper a rectangular space has been cut out from the instep down. The top of the boot is of red woolen cloth called truk and is sewed on the margin of this upper, and also fills the rectangular space adorned with insertions of white and green and red. The red truk top is continued in a strip up to the margin of the boot leg. Above the red top is a broad band of green woolen material, and above this a band of blue cotton stuff. Inside of this complicated top is sewed a lining of very coarse woolen blanketing in diagonal weaving. The boot leg is split open at the back down as far as the upper margin of the red top. Length, 11 inches; height of upper, 2 inches; height of red flannel top, 4 inches; height of green top, 5 inches; height of blue top, 4 inches.¹

Example No. 131202 is a pair of shoes from Mongolia, made of leather and puckered in front, drawn and sewed together in a T-shaped seam at the back of the heel, a flap being turned up and fastened down. The vamp is a piece of leather fitting under the margin of the crimped portion and bound to it by the puckering string. This rude example must be compared with the example (No. 20797) from Sitka, being similar to it in the puckering of the front and the peculiar formation of the heel and the vamp. There is no heelpiece sewed on above, as in the Sitka specimen. Length, 11 inches. Collected by W. W. Rockhill.

Example No. 131044 is a pair of sandals from Sechuan, made of bast upon four warp cords, with filaments of straw. The sole is woven in wicker-work. In passing across, the outer threads are finely twisted, but across the middle of the sole above and below they are left plain, and on the bottom are cut off at each turn just below and parallel with the margin all around, leaving a sort of fringe work or tuft. At the heel and toe the cords forming the outer margin of the warp are turned up for an inch or two and wrapped with twine or with braid. Upright strands to the number of three or more extend for an inch or two along the outside of the great toe, the little toe, and at the sides of the heel.

¹ Figured in Rockhill's "Journey through Mongolia and Tibet."

Through these are rove the long lacing which is tied above the instep. As regards the upper lacing, this shoe should be compared with No. 131198 from Kansu, China, collected by W. W. Rockhill. Length, 11 inches.

In most respects these two examples are like No. 116211 (p. 331), from Yokohama, Japan, collected by S. Kneeland.

Mr. Rockhill brought from Kansu, in northwestern China, a pair of shoes (No. 131198, U. S. N. M.) that represent a type. The sole is made of sennit or braid of hemp strands, half an inch or more wide. Beginning in the central line of the sole the sennit is coiled backward and forward six or more times. The whole fabric is held together by sewing through from side to side with stout twine. Sailors make the same kind of soles from manila yarn braided into sennit and the very same sole exists in Spain and Peru. The upper part of the shoe is a very complicated affair, but the style is common. At the toe and the heel stout cords are inserted between the last two turns of the sennit and extend in front up over the middle toes, dividing on the back of the foot below the instep. In the rear these cords, to the number of five or more, extend well up on the heel. Both sets, front and rear, are sewed together with a common weaving finer cord. The lacing of the shoe is rove through loops at the ends of the upright cords. At the sides of the toes and of the heel a series of small cords pass from the sole up to the lacing, which is doubled and are neatly woven into it. In many Chinese and Korean shoes this system of upright cords like a delicate balustrade is common. In the U. S. National Museum there is an Athapascan Indian moccasin upon the bottoms of which a sole of coiled sennit has been securely sewed. Mr. Rockhill says that you rarely see Chinese go barefooted. The poorest of them wear straw sandals. This is for northern China, but Dr. Graves says that many of the coolies go barefoot. Many wear sandals, which on the road do not last very long, but they are cheap and may be found at stalls and shops by the roadside. Others wear leather sandals that are more lasting.

Example No. 55864 is a pair of shoes from China, each consisting of two parts, the sole with its lacings and the upper. This is a very important specimen in connection with No. 116211 and No. 131044 (fig. 43) because it explains the use of the pointed portions at the heel and at the toe. The sole part is built up of rice straw upon four twines laid down in the same way as No. 116211 and the warp is of coarsely woven rice straw. The projection at the toe, the loops at the sides of the toes and at the sides of the heel are precisely as in the examples mentioned, but the upper part of the shoe is a slipper made of plantain leaf folded together ingeniously to fit the foot. This slipper also fits into the straw sole and is lashed on by means of lacing passing over the toe, through the loops, and above the heel. In looking at the ordinary sandal of this kind it is difficult to see how it could be made comfortable on the

EXPLANATION OF PLATE 3.

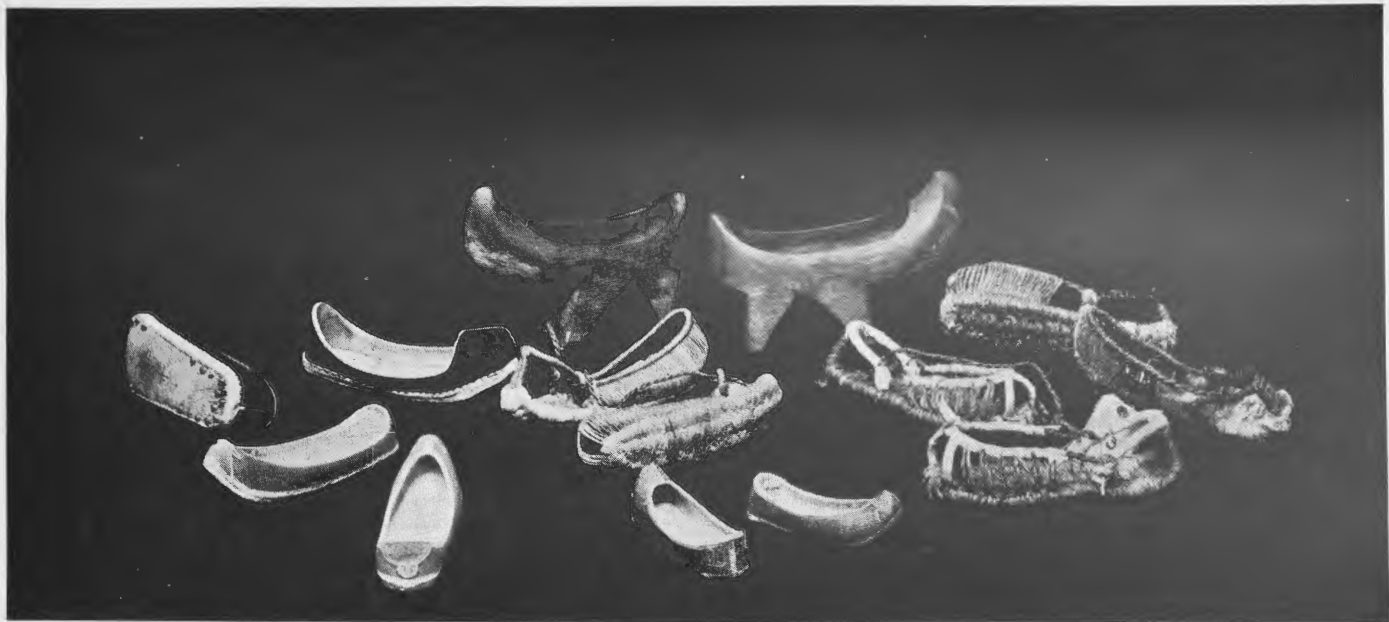
KOREAN SHOES AND SANDALS.

The intermediate position of Korea with reference to Mongolia, China, and Japan, as well as the geological and social conditions about the people, produce a great many kinds of footwear. In the U. S. National Museum are the following varieties:

1. The Chinese low shoe with thick sole made fine or coarse, and often foxed with leather or cloth of different colors.

2. The stilted shoe with endless variety of form in Japan, but having an upper more like a sabot, modeled after the Chinese low shoe.

3. The straw openwork low shoe (*chip-seki*). This is shown in three examples on the plate. The woven sole is similar to that of the Japanese and Chinese. The upper never has strings between the toes nor loops about the margin of the sole, but is built up of any number of vertical twine filaments united at the top by means of a horizontal twine. As will be seen in the plate, rags cooperate with the straw twine to form a padding. The rope on the back of the foot is attached to upright ankle loops and a rope heel-band wrapped with bast or cloth. There are several examples in the U. S. National Museum, collected by Ensign J. B. Bernadou, U. S. N.



KOREAN SHOES AND SANDALS.

Hough, "The Bernadou, Allen, and Jouy Korean Collections in the U. S. National Museum," Pl. XX, Report of the Smithsonian Institution (U. S. National Museum), 1891.



foot, but this example explains all the parts of the sole. It is also to be noted as a very coarse, first step, in the invention of the stocking. Length, $13\frac{1}{2}$ inches.

One of the Korean sandals shown in pl. 3 has the sole made of a warp of six coarse cords upon which is woven in wicker style a weft of twisted rushes. Two of the twines extend up and back of the heel. From the top of this extends quite across the upper margin of the foot a cord, like a rail about a boat. From this descend to the sole stout lashing on each side of the arch of the foot, and a close arrangement of parallel cords all around the front half of the foot. There are no lacings. A child's sandal of this type (No. 151146, U. S. N. M., 6 inches long; Seoul) is identical with Chinese specimens before described.

Dr. Hough describes and figures the following types of Korean shoes:

(1) Rain clogs or sabots, with stilts beneath. This feature may be traced in western Asia; the stilted shoe, beautifully inlaid and adorned, abounding in Persia and India.

(2) Felt shoes, lined with leather, Chinese types.

(3) Travelers' sandals, with straw soles, upper border like a balustrade connected with the sole by many parallel twines. This class exists in many styles,¹ and is perfected in China.

The Japanese sandal with single toe string and padded bands over the back of the foot will be referred to as of Tartar origin.

The Japanese laced sandal, based on Chinese motives, involves two types of manufacture, one for the sole and one for the upper. The weaving on the sole is based on four warp filaments, ropes, or bundles of straw. The weaving on the sole is done with long, coarse filaments in wicker style. The warp being rigid, the weft presents a coarse appearance as in corded goods. Practically, the shoemaker takes two bundles of filaments or two small ropes more than twice the length of the foot, doubles them at the middle, and unites the bends at the toe; or he takes one long rope or twine, and at its middle forms a couple of loops 3 or more inches long. The two halves of the cord are carried forward to the toe and beyond it. Here they are doubled back and the four strands securely and neatly wrapped together. This forms the projecting portion at the toe, to be later mentioned again. The two ends are carried back to the heel and crossed at the starting point. The weft of the sole is then woven in; the extended ends of the warp ropes, a foot or more long, will serve for lacing.

In the simplest sandal the sole constitutes the chief part of the object. But in the development of the most beautiful examples there has been improvement in two directions simultaneously, to wit, in the workmanship and material of the sole and in the creation and perfecting of the upper. In the coarsest sandals the soles are of bark or

¹Hough, "The Bernadon, Allen, and Jouy Korean Collections in the U. S. National Museum," *Rep. Smithsonian Inst. (U. S. Nat. Mus.)*, 1891, pl. xx.

bast, evidently made in a few minutes. They are as ugly as a garment could well be. In the finest examples, the bundles of warp filaments are nicely laid cylinders and the weft is a neat and uniform cord of rushes or straw.

The provision of what in the modern shoe corresponds to the welt, or middle piece between sole and upper, has evidently been the occasion of much thought among shoemakers in all ages and regions. The material at once drives welt makers apart—the workers in hide, felt, and the like taking one road, the workers in fiber quite another. The Japanese maker of fiber shoes has two expedients ready at hand; he can utilize the loops and ends of his warp filaments in securing the top of the shoe or he may, as he goes on weaving, gather into the selvege along its upper margin loops of bast or rush with the free ends projecting upward any distance desired. Indeed this is done. So that at the finishing of the sole there would be projecting from its margin upward a fence or hedge of fiber ready to become twine of an open upper or warp of a closed texture.

Let us suppose that a closed upper is in mind. Of these there are many varieties, but they may be divided into two, namely, those with heels, becoming slippers or low shoes, and those without heels. In the example with heels as many rows as are desired of twined weaving in rush or straw or bast are worked around on the warp filaments rising from the soles. In a great many examples this weaving is boustrophedon, and in the best specimens in colored and uncolored fine filaments the effect is that of chain stitch in embroidery; but even in the coarse sandals for road work the effect of the weaving is always pleasing. There are examples of this variety in which the rows of twined weaving forming the heel equal in number those across the front. In such examples the effects of the twining are in bands and lines of colored and uncolored material, varied with geometric and diaper patterns, to which this style of technique cleverly lends itself. But in most examples in the U. S. National Museum the heels are low. In such, four or five rows of twined weaving pass entirely around the sandal, then the vamp is woven boustrophedon, and finally a finishing row passes entirely around. There remain now the whole set of warps of the upper, sticking up an inch or more. These are braided to form an ornamental border and then turned down flat inside the shoe. The braiding is done in three ply; at each braid one filament is laid down and one taken up until the entire border is completed.

The heelless sandal or slipper without lacing is for house wear chiefly, and resembles the other except in the treatment of the heel, and may be dismissed with a brief mention. In a pretty example in the U. S. National Museum (No. 92861) the first row of twined weaving in rather coarse twine is carried entirely around the margin of the sole, but at the heel it passes down and under the sole a little way, and four short rows of this weaving border the heel, the last scarcely rising to

the level of its upper surface. The upward projecting elements at the heel are then inclosed in a pretty flat fabric of twined weaving boustrophedon. In many fine examples the tip is a circular insertion like a projecting transom, the weaving is the same, however, only this hooded or projecting tip is always plain colored. As hinted above, the motive in this type of shoe is from the Chinese and Korean area.

Example No. 116211 is from Yokohama, Japan (fig. 43). These sandals are built on a warp or foundation of coarse straw cord. A single cord 10 feet long is doubled in the middle around the front of the foot, the two ends are carried back the length of the foot and 4 inches to form the heel loops. Here they are both doubled and carried back between the outer border cords over the first loop, and extend outward 30 inches to form the lacing. With the four warp strands thus provided for, the

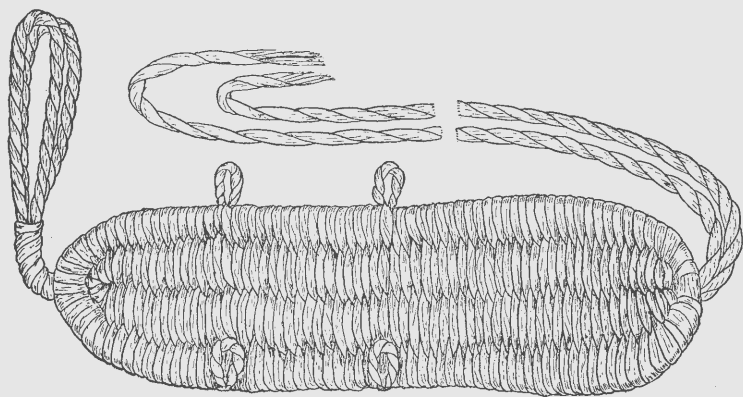


Fig. 43.

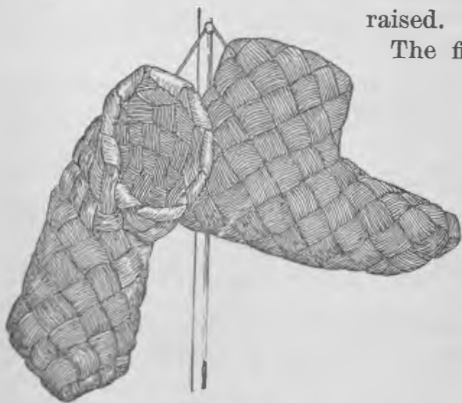
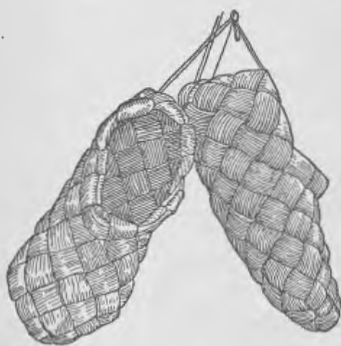
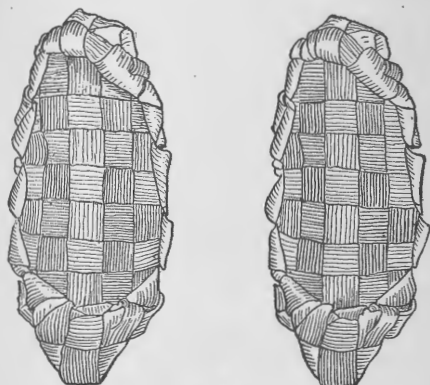
WICKER SANDAL OF STRAW FROM YOKOHAMA, JAPAN.

Cat. No. 116211. U. S. N. M. Collected by S. Kneeland.

weft consists of a close wicker weaving of very slightly twisted bunches of straw fiber packed closely together at the margins of the heel and just in front of the arch of the foot. On each side loops are formed in the course of the weaving by extending the weft filaments a little way. These loops extend about an inch beyond the border of the sandal. The lacing proceeds from the tip of the sandal across the foot, through the loops on the side, passed back through the heel loops, and back again through the side loops and over the instep, where it is tied. These cheap sandals carefully studied form the type or foundation characteristics of the more refined foot gear of the Japanese. Length of sandal, 9 inches; of foundation twine, 5 feet. Collected by S. Kneeland.

Example No. 73084 is a pair of sandals brought to the U. S. National Museum from Nikko, Japan, by P. L. Jouy. They are each made of two thin and one thick piece of ox hide, closely sewed together by a flat thong of the same material near the edge. The hair has been left

are here reproduced (figs. 45, 46, 47). The first and simplest is an attempt in birch-bark checker weaving to produce a sandal that will hang on to the foot or will roll up at the sides and incase the toes and the heel and furnish loops for lacing if desired. This is one way of reaching the result achieved by the Africans and Peruvians in the use of rawhide and the Ainos and Japanese in the use of bast and other vegetable fiber. A bit of art is thrown in by alternating the outer and the inner side of the bark.



Figs. 45, 46, 47.

SLIPPERS, LOW SHOES, AND BOOTS MADE OF PLAITED BIRCH BARK, FINLAND.

From Hottel, in the *Revue Ethnographique*.

The next step in the evolution is a low shoe or moccasin in bark. The Pueblo Indians likewise weave shoes or moccasins in the split leaf of the yucca.

The third step is the production of a boot reaching as high up the leg as the rigidity of the material would admit. There is no preparation for a lacing on these specimens. These examples should be compared with the boots from Tate Yama, Japan (fig. 44), collected by P. L. Jouy. The question of early Finnish influence in northern Japan might be raised.

The fishskin boot may be traced entirely around the salmon-fishing area. Speaking of the Amur people and their use of fishskin as waterproof material, Ravenstein says that though dangerous as a constant article of food, the fish of these rivers (Usuri and Amur) are invaluable on account of the imperishable garments made of their skins. In boots made of such fishskins you may wade through rivulets and walk in the snow as on the dry ground, equally protected against the cold and moisture.¹

¹ Ravenstein, "Russians on the Amur," London, 1861, p. 96.

Bush found among the Yakuts, who are Tartar, that their torbossas or boots of heavy tanned deerskin were made "to fit the foot snugly and at the toe to arch over the foot like the bow of a skate." Welts are sewed in the seams, and "at the ankle two very long and broad strips of buckskin are fastened, to be wound snugly about the leg half way up to the knee."¹ These characteristics agree with the Kashmir and Tibetan specimens of Rockhill and Abbott.

According to Lansdell, Tartar men and women wear top boots and generally leather goloshes over them, so that on entering a house or mosque they have only to slip off the goloshes to secure clean shoes.² There are specimens of these in Dr. W. L. Abbott's collection in the U. S. National Museum.

The torbossas of the Kamchatkans are fur boots reaching to the knees, made of the skin on the deer's legs, as being tougher and having shorter hair, soled with bearskin or sealskin, tied about the knee and ankle with thongs. Chazees, or fur socks, are made of dog, reindeer, or wolf skin, worn with the fur next the foot, and are not intended to fit snugly.³

The foot covering of the Chukchi consists of reindeer or sealskin, which above the foot are fastened to the trousers in the way common among the Lapps. The soles are of walrus skin or bearskin, and have the hair side inward. On the other part of the pautaloons the hair is outward. Within the shoes are sealskin stockings and hay.⁴ The summer coverings of the lower extremities are often as long in the leg as our sea boots.

From whatever cause, the fact remains that there is no break between the foot covering of the Chukchi and that of their eastern neighbors in Asia and northwestern America. The Eskimo examples will be studied geographically, commencing with the west. Mr. John Murdoch has with great care worked out the pattern, the making, and the varieties of the Point Barrow boots, and his types may be used in studying the rest.⁵ The boots and shoes of the Point Barrow Eskimo have uppers of two kinds—those with the hair on and those made of black dressed sealskin fitted to heelless, crimped mocassin soles of different material. The crimped soles are of three sorts of material:

(1) White, urine tanned, snow-bleached seal skin for winter wear when the snow is dry; not suited for rough and damp salt-water ice.

(2) Sealskin dressed with the hair on and worn flesh side out; best for summer boot soles on wet ground and melting snow.

¹ Bush, "Reindeer, Dogs, and Snowshoes," New York, 1871, p. 161.

² Lansdell, "Through Siberia," Boston, 1882, pp. 58-59.

³ Bush, "Reindeer, Dogs, and Snowshoes," New York, 1871, p. 61.

⁴ Nordenskiöld, "Voyage of the Vega," 1881, II, pp. 98-99.

⁵ Murdoch, "Ethnological Results of the Point Barrow Expedition," Ninth Ann. Rep. Bureau of Ethnology, figs. 72-82.

(3) Waterproof soles of oil-dressed walrus, bearded seal, polar bear, or best of all white whale.¹

The cutting out and making of the boot, as well as the process of turning up and crimping the sole, are minutely worked out by Murdoch.

Example No. 74042 (fig. 48) is a pair of woman's pantaloons (kûmûñ) from Point Barrow, Alaska, collected by Captain Ray and carefully illustrated by Murdoch. They may be thus described: Soles of white tanned



Fig. 48.

WOMAN'S PANTALOONS, USED BY THE ESKIMO
OF POINT BARROW, ALASKA.

From a figure in Murdoch's "Ethnological Results of the
Point Barrow Expedition" Ninth Annual Report of the
Bureau of Ethnology.

Cat No. 74042, U. S. N. M.

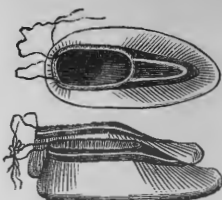
seal skin turned up and puckered or crimped about the margin. Uppers of deerskin in two pieces (vamp and quarter), trousers of deerskin, made from the short-haired skin from the deer's legs. The pantaloons in America is found only among western Eskimo and Athapascans. Murdoch says that these pantaloons are always worn with the hair out, and usually over a pair of underpantaloons of the same shape but of softer skin with longer hair, worn next the skin with stocking feet. In summer the inner ones are worn, the feet being protected by sealskin waterproof boots, shown in pl. 4.²

Example No. 56750, from Point Barrow, is a man's boot (fig. 49) with deer-skin leg and seal-skin sole. The leg and upper are in four pieces—back, two sides, and front. There are strings attached to the sole on the margin below the ankle joint. These are brought up above the heel around in front and laced about the lower part of the leg. Collected by the Ray expedition. Murdoch, in describing the structure of this specimen, says that this is a type of the everyday pattern. The bottom is cut off accurately to fit the sole; there is no insertion of orna-

mental bands or piping, but they are often made of a pattern like that of the lower part of the women's pantaloons, that is, with the uppers separate from the leg pieces, shown in fig. 48 and in pl. 4, fig. 6.

¹ Cf. Murdoch, "Ethnological Results of the Point Barrow Expedition," Ninth Ann. Rep. Bureau of Ethnology, p. 130, referring to Crantz, i. p. 167, and Simpson, pp. 242-266.

² *Ibid.*, p. 127, with references to Petitot, Beesels, Egede, Crantz, Parry, and Franklin.



ESKIMO SHOES AND BOOTS FROM NORTON SOUND REGION AND MACKENZIE RIVER DISTRICT.

EXPLANATION OF PLATE 4.

1	2
3	4
5	6
7	8

ESKIMO SHOES AND BOOTS FROM NORTON SOUND REGION AND MACKENZIE RIVER DISTRICT.

Fig. 1. SUMMER BOOTEES. Puckered sole of white sealskin; upper and leg of seal pelt, hair side in; gore in front of seal skin painted red. The lacings, of seal pelt, embroidered in quill work, are attached to the margin of the gore on the top of the foot, pass through loops under the ankles, cross on the back of the shoe, and are tied in front. Collected at Norton Bay by W. H. Dall.

(Cat. No. 7591, U. S. N. M.)

Fig. 2. LOW SHOES OF BLEACHED SEALSKIN. Puckered well up over the foot. These shoes have a gore and tongue piece on the top of the foot and drawstrings about the upper margin, suggestive of Athapascan moccasins. Collected from Anderson River, Mackenzie District, Canada, by R. MacFarlane.

(Cat. No. 2060, U. S. N. M.)

Fig. 3. WINTER BOOTS. The sole and footing are of sweated seal hide, bleached on the snow, hair side out and neatly puckered. Above this a band of dark hide, with the hair side out, is sewed in a water-tight joint. This is attached to the deerskin top by means of a puckered seam. The top is ornamented with tabs and strips of hide neatly inserted vertically. Collected from the Anderson River Eskimo by R. MacFarlane.

(Cat. No. 3983, U. S. N. M.)

Fig. 4. WINTER BOOTS. These are similar to those shown in fig. 3, but are more ornamental, bands of skin with hair on being inserted vertically. Gift of R. MacFarlane.

(Cat. No. 3979, U. S. N. M.)

EXPLANATION OF PLATE 4—Continued.

Fig. 5. **MAN'S SEALSKIN WATERPROOF BOOTS.** The puckered soles of sealskin are cured with the hair on and are unhaired by friction. The uppers are of unhaired oiled hide. The seam across the instep is the joint of the two edges of the top, made almost of one piece. There is a drawstring in a hem around the upper margin. Gift of C. P. Gaudet. From Anderson River, Canada.

(Cat. No. 1332, U. S. N. M.)

Fig. 6. **MAN'S WATERPROOF BOOTS.** Sole, of black seal hide puckered and run on to a narrow strip of soft white hide all around; top, of deer pelt in two pieces; leg, of vertical strips of deer pelt; border, of several strips of variously colored pelt; all from parts of the Caribou skin, selected for ornamental effect. Between this border and the boot top is a fringe of wolverine fur. The connection between upper and top should be compared with fig. 48. The lacings proceed from the margin of the sole below the ankle bones, and are wrapped about the heel and the ankle. Eskimo of Anderson River, Canada. Gift of R. MacFarlane.

(Cat. No. 3980, U. S. N. M.)

Fig. 7. **ESKIMO WOMAN'S WINTER BOOTS.** These boots have (1) a sole and footing of white sweated sealskin, bleached in the snow, and puckered nearly all around; (2) a narrow upper of seal hide, flesh side out; (3) tops of deerskin, having the seam ornamented with a strip of embroidered hide. There is a drawstring in a hem on the upper margin. Anderson River Eskimo. Gift of R. MacFarlane.

(Cat. No. 3983, U. S. N. M.)

Fig. 8. **WATERPROOF SEALSKIN BOOTS.** These boots are from Yukon River and consist of six parts—the sole, upper, leg, extension top, ornamental band, and lacings. The sole is of black dried sealskin from which the hair has been carefully removed by shaving. It is turned up and molded into shape so that the crimping has almost disappeared. The upper is of brown oiled leather, its lower border is turned up all around inside of the margin of the sole, and the two upturned edges are run together, the stitches being caught over a cord on the inside, as in birch-bark sewing. The two vertical edges of this upper are joined together by a diagonal seam, as shown in fig. 5 of this plate. This diagonal joint is sometimes sewed only on one side, as in fig. 53. In specimens from Greenland, collected by Dr. C. Hart Merriam, the seam extends on both sides of the instep. Above the upper, the leg consists of a broad band of white sealskin cured by sweating and bleaching in the snow. On top of this band, or between it and the extension top, is a pretty insertion of brown and white sealskin with piping. The extension top is of white sealskin. Collected by J. T. Dyar.

(Cat. No. 10486, U. S. N. M.)

Example No. 56759 is a pair of man's dress boots of deerskin. These differ from the common boot in the insertions of different colored hide alternating along the horizontal and vertical seams. The soles are of white sealskin, neatly crimped, with the edges coming to a point at the toe. Between the upper and the sole are five bands of seal hide, the hair black and white alternately. The leg is hemmed at the top for a drawstring, and there are lacings at the ankles (fig. 50).

Example No. 89834 (fig. 51) is a pair of man's dress boots from Point Barrow, Alaska. The tops are made from the skin of the mountain sheep (*Ovis montana*). The soles are much turned up all round, and, like the last described pair, recall the crimped moccasin of the Athapascans. There are three ornamental bands of sealskin—black, white, and black—between the sole and the upper. Strips of mountain sheepskin and dark-brown deerskin, tagged with red worsted, fringe the side seam of the leg. Little tags are also cut in the edge of the side piece on its hinder margin. Mr. Murdoch says that this pair of boots was brought from the east of Point Barrow by one of the Nuwuk trading parties in 1882, and this may account for the material and the shape of the sole. His conjecture is confirmed by comparing the specimen here described with figures 3, 4, and 7 in plate 4.

Example No. 56749 is a pair of man's dress boots from Point Barrow, with soles crimped high up. The ornamental bands are inserted in the same manner between sole and upper, and similarly pointed above the phalanges. There is a difference in the side seam, and the insertion of a larger piece to increase the size of the leg above, let in by an oblique seam across the calf.¹ These, according to Murdoch, fairly represent the style of full-dress boots worn with loose-bottomed breeches, as in his figure 69, page 125. They all have drawstrings just below the knee, and often have no lacings about the ankles. He calls attention to the drawstring as an eastern fashion, but prefers the Point Barrow style of tying the breeches down over the tops of the boots. The Smith Sound



Fig. 49.

MAN'S BOOT AND TROUSERS UNITED, USED BY THE ESKIMO OF POINT BARROW, ALASKA.

From a figure in Murdoch's "Ethnological Results of the Point Barrow Expedition," Ninth Annual Report of the Bureau of Ethnology.

Cat. No. 56750, U. S. N. M.

¹Murdoch, "Ethnological Results of the Point Barrow Expedition," Ninth Ann. Rep. Bureau of Ethnology, p. 133.

natives are said to tie the boots over the breeches. The boots are all joined with reindeer sinew by fitting the edges together and sewing them "over and over" on the "wrong" side (fig. 52).



Fig. 50.

MAN'S LONG BOOT, USED BY THE
ESKIMO OF POINT BARROW, ALASKA.
From a figure in Murdoch's "Ethnological Results
of the Point Barrow Expedition," Ninth
Annual Report of the Bureau of Ethnology.

Cat. No. 56759, U. S. N. M.

the instep appears in Greenland. No. 151668, collected by C. H. Merriam. Soles of white whale skin; leg and upper all of one piece, having one double, water-tight seam in front of the leg and across the instep to the sole at the ankle joint. The upper is joined to the sole in such manner that the insides of both come together; the two are then run together with fine stitches. A band of white seal-skin run on ornaments the top, and a drawstring is inserted in a binding of black sealskin. Lugs or

loops of white whale skin for lacing are attached to the margin of the sole on either side at the ball of the foot and beneath the ankle joint. Murdoch says that the ends of the string are passed through the front

Example No. 153892 is a very pretty specimen of the Eskimo boot from Point Barrow, with the sole puckered in front and at the heel after the manner of the Athapascan shoe. The vamp and heel are separate, as in a modern boot; the upper margin of the vamp, the heel, and the outer leg of the boot are sewn together. The leg consists of alternate strips of white and brown reindeer hide. The upper part of the boot is made of eight rows of deerskin having different colored hair, bordered below with a strip of skin of the arctic fox (*Vulpes lagopus*). Length, 10 inches. Collected by John Murdoch.

Example No. 76182 (fig. 53) is a pair of woman's waterproof boots. The tops are of black dressed seal-skin reaching to the knee. Murdoch says that they are made full at the instep and ankles to reduce the number of seams and the chances of leaking. This single seam on one side of

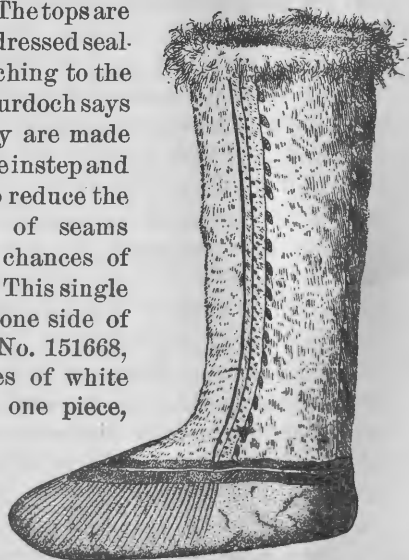


Fig. 51.

MAN'S ORNAMENTAL BOOT, USED BY THE ESKIMO OF
POINT BARROW, ALASKA.

From a figure in Murdoch's "Ethnological Results of the Point
Barrow Expedition," Ninth Annual Report of the Bureau of
Ethnology.

Cat. No. 89634, U. S. N. M.

loop so that the bight comes across the ball of the foot, then through the hinder loops, and are crossed above the heel, carried once or twice around the ankle and tied in front. The waterproof boots from Alaska have the seam on both sides of the instep.

Murdoch describes the manner of sewing a waterproof seam among the Eskimo: "The two pieces are put together, flesh side to flesh side, so that the edge of one projects beyond the other, which is then blind stitched down by sewing it over and over on the edge, taking pains to run the stitches only part way through the other piece. The seam is then turned and the edge of the outer piece is turned in and run down to the grain side of the under with fine stitches that do not pass through to the flesh side of it. Thus in neither seam are there holes through both pieces at once."¹

This same notion of blind stitching may be seen on Athapascan shoes, even among the Hupas in California.

Lieutenant Schwatka says that a certain kind of boot for use in the water is found among the Alaskans, made of seal or fish skin, which is almost if not fully as impervious as those made of rubber by more civilized people.² His travels were about the Yukon River.

Example No. 43345 is a pair of shoes or boottees from Golovina Bay, consisting of three parts—the sole, the vamp, and the heel piece. The soles are of black seal skin, turned up all around and puckered in front and in the rear, looking like an old man's chin. The vamp is of white sealskin and is quite ornamental. Its lower edge, where it is attached to the upper margin of the sole, consists of seven bands of sealskin of different colors and varying widths, making an extremely elaborate device. From this the vamp extends upward quite well on the foot. The heel is a piece of plain white sealskin, which is sewed to the margin of the sole and extends to the top of



Fig. 52.

MAN'S DRESS BOOTS OF DEERSKIN, USED BY THE ESKIMO OF POINT BARROW, ALASKA.

From a figure in Murdoch's "Ethnological Results of the Point Barrow Expedition," Ninth Annual Report of the Bureau of Ethnology.

Cat. No. 56749, U. S. N. M.

¹Murdoch, "Ethnological Results of the Point Barrow Expedition," Ninth Ann. Rep. Bureau of Ethnology, p. 134.

²Schwatka, "Military Reconnaissance in Alaska," p. 105.

the boot. The border at the top is of the same color and has below it a little band of sealskin with the hair on. All the parts are united by means of cording or piping of different-colored leather. The lacing is attached to the front loops on the sole by sewing. They are crossed above the back of the foot, passed through two lugs of white leather at the side of the heel, then across the instep, where they are tied. Length, $9\frac{1}{2}$ inches. Collected by E. W. Nelson.

Example No. 129822 is a pair of boots from St. Michaels, Alaska. The sole is made from sealskin, turned up and puckered; the margin on the toe

and heel turned out so as to form the profile of a human chin. The lugs consist of straps, as on a boot, and the front pair are sewed on to the lacing. The top is of brown dressed sealskin and is run on to the margin of the sole more than half way round in front by a piping or welt. This top consists of a front, or vamp, and the heel, which extends from the border of the sole to the upper margin of the boot. Between the vamp and the leg is a gore or insertion of white skin, and a band of white skin is let in between the sides of the vamp and the leg; on that two narrow borders of dark leather have been run. From this vamp to the upper margin the front of the leg is decorated in the following manner: A piece of hide is inserted between the two margins of the top, and between these margins a piece of white leather doubled up for a piping, then the other parts are sewed together with a thong or leather string. The upper border is decorated with a piece of



Fig. 53.

WOMAN'S WATERPROOF SEALSKIN BOOT, USED BY THE ESKIMO OF POINT BARROW, ALASKA.

From a figure in Murdoch's "Ethnological Results of the Point Barrow Expedition," Ninth Annual Report of the Bureau of Ethnology.

Cat. No. 76182, U. S. N. M.

white hide; this is adorned with a narrow strip of dark hide run on, and at the juncture of this band with the top the second row of stitches has, alternating with the white, little bits of dark leather one-half inch wide sewed on. Length, $10\frac{1}{2}$ inches. Collected by General Hazen, U. S. A.

There is in the National Museum a shoe similar to No. 43345, but the strips of different colored skin inserted between the vamp and the sole are wider, more numerous, and are decorated with geometric figures

effected by running narrow strips of leather into the texture of the body of the shoe, a very common style of ornamentation in Greenland. This specimen is from Norton Sound, and is one of the most beautiful examples of the shoemaker's art. Length, $8\frac{1}{2}$ inches. Collected by E. W. Nelson.

Example No. 10467, from the Yukon River district, has the following marks: First, the sole is a stout piece of seal hide, dressed without the hair; puckered around the toes and heel in exactly the same fashion as the sole of the Navajo shoe, No. 9549. To this margin is sewed a strip of red sealskin, flesh side out, about an inch wide all around, and to this is whipped the top of the boot made up of twenty-five pieces or bits of deerskin sewed together. Just above the ankle there is a dividing line between the shoe proper and the leg. This latter part is very ornamental, consisting of skin from different parts of the deer's leg, with patches of wolverene skin front and back; the upper part consists of several bands of skin from the leg of the deer, the hair being white and trimmed close above the seams. Drawstrings are inserted between the sole and the red strip, just below the ankles, and these are brought up over the heel and instep and around the ankle to bind the shoe to the foot. Length, $9\frac{3}{4}$ inches. Collected by J. T. Dyar.

Example No. 38771 is a pair of boots from Unalakleet, Yukon district, Alaska, consisting of a heavy black sole turned up all around and puckered at the ends. The upper part consists of the vamp, the heel in a single piece, and the upper border. The vamp, before being backstitched to the upper margin of the sole is ornamented more than half way round with a pretty band of brownish leather, into which two rows of narrow stitching of rawhide thread are run making a web-like ornament; it extends well up above the instep and the heel. A little higher still, and the two join together by a very neat seam, in which piping is introduced in leather of a different color. The border of the boot is a separate strip of leather run on to the top, and a very narrow band of brown leather is inserted at this point. Around the top is a little strip of deerskin with the hair on. The lacing consists of two straps sewed on to the upper margin of the sole opposite the ball of the foot. These are crossed over the instep and passed down to the sides of the heel through two loops of leather; they are then brought around the back of the heel and tied in front over the instep. Length, 10 inches. Collected by E. W. Nelson.

Example No. 7612 is a pair of shoes from Nunivak Island. Soles made of sealskin turned up and crimped. The upper part consists of a broad strip passing entirely around the foot, with the leg attached above that. The tongue is inserted between the leg and the vamp and the lacing. The lacing and the tongue are ornamented with embroidery in quill work, which shows a little contact between the Indian and the Eskimo. Length, 10 inches. Collected by W. H. Dall.

In the early spring the Eskimo women, of Ungava, north of Labrador, are busily engaged in making boots for summer wear. The skins of the seals have been prepared the fall before and stored away till wanted. The method of skin dressing is the same as practiced by Eskimo elsewhere. If it is designed to make boots for a man, the measure of the height of the leg is taken. The length and width of the sole is measured by hand, stretching so far and then bending down the middle finger until the length is measured.¹

The foot wear of the Hudson Bay Eskimo, collected by Lucien M. Turner, has the following characteristics:

The boots and shoes differ in material and pattern for different seasons of the year. In all the styles the stout soles turn up an inch or two all round the foot, a tongue piece covers the top of the foot and above the sole and the tongue the top varies in height, either being long enough to reach the knee or else rising a little above the ankle. The low-top half boots are worn over fur stockings in warm weather. These stockings are made of short-haired deerskin with the hair worn inside. These low-top boots are worn outside the long boots in severe weather. The Hudson Bay Eskimo also wear Indian moccasins, sometimes over a pair of inside shoes and sometimes as inside shoes. The Indians in proximity with the Eskimo here are the Nascopi and Montagnais Algonquian, and features of Algonquian moccasins are to be seen in the more northern boots. The wearing of overshoes, of stockings and overshoes must not be overlooked in primitive life, and may be kept in mind in the interpretation of ancient pictures and sculptures. The Hudson Bay Eskimo use for waterproof soles the skin of the beaver or of the harp seal, and prefer the former. For indoor shoes or for those to be worn in cold, dry weather, the skin of the white whale was chosen. The skins of the smaller seals are made into soles, either with the flesh or the hair side out. They are comparatively waterproof if the black epidermis be allowed to remain. The creamy white leather made by allowing the skins to ferment until hair and epidermis may be scraped off and then stretching and drying them in the cold air does not exclude the water and can be used for soles only in perfectly dry weather. Buckskin or deerskin soles are worn with snow shoes, as the feet are not so liable to slip, and the porous skin allows the moisture of the feet to escape more readily.

The tongue and the heel band of the Hudson Bay shoe are generally made of dressed sealskin; the legs or uppers are of sealskin with the hair on.

Example No. 90359 (fig. 54), collected by Lucien M. Turner, is a pair of boots with buckskin feet and tongue and sealskin tops. The combination of Eskimo and Indian is noteworthy. Throughout Mr. Turner's Ungava collection there are many specimens of this character. As in

¹ Cf. Turner, "Ethnology of the Ungava District, Hudson Bay Territory," Eleventh Ann. Rep. Bureau of Ethnology, p. 206.

Alaska the arts of the Yukon pass insensibly from Indian to Eskimo, so here.

Example No. 9035 (fig. 55) is a pair of low shoes from Hudson Bay Eskimo, with white sealskin soles, black sealskin tongue and heel band, and deerskin tops. The tawed and smoked reindeer skin for the tops was purchased from the Nascopi Indians. The noticeable features of these specimens are the similarity of the white skin sole with those of the western Eskimo, the pointed tongue or upper, and the narrow inserted heel band between sole and top. In some of the more elegant

western forms of boots half a dozen band welts and pipings of parti-colored skin and fur are inserted.

One kind of foot gear of these Eskimo consists of a bird skin short sock with a padding of grass nicely distributed over the sole. Outside of this comes a bearskin leg sewed with great skill to the natural sole of the plantigrade and abundantly wadded about the foot with dry, nonconducting straw.¹

Stearns thus minutely describes the process of boot making by Indians of Old Fort Bay, Labrador: "From a lot of sealskins one is selected, either from a harbor seal with the hair on or a large harp seal from which the hair has all been scraped off. In either case the skin, to be the most serviceable, must be well scraped of fat on the inside and dried for two or three months on some frame on which it has been stretched to



Fig. 55.

LCW SHOE OF UNGAVA BAY ESKIMO.

From a figure in Turner's "Ethnology of the Ungava District, Hudson Bay Territory," Eleventh Annual Report of the Bureau of Ethnology.

Cat. No. 90356, U. S. N. M.

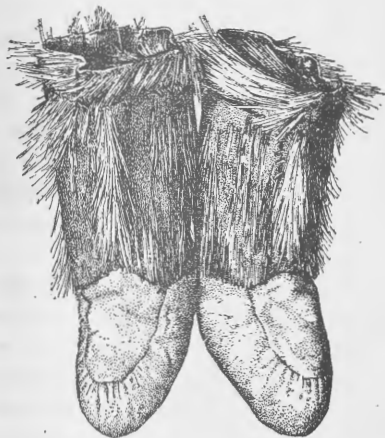


Fig. 54

SHORT BOOTS OF UNGAVA BAY ESKIMO.

From figure in Turner's "Ethnology of the Ungava District, Hudson Bay Territory," Eleventh Annual Report of the Bureau of Ethnology.

Cat. No. 90359, U. S. N. M.

its fullest extent in the sun, exposed on the wood pile or roof of the house (after the hair has been taken off, if a harp seal, and with

¹ Dr. E. K. Kane, "Arctic Explorations," Philadelphia, 1856, pp. 22-24.

the hair on, if a harbor seal). These dry skins will not shrink, and for every purpose of wear are infinitely better than the shoes sold in large numbers, made of quickly dried skins, sewed upon wooden forms, which shrink and tear, while they soon wear useless. Out of them the boot leg is cut from a pattern of any kind the wearer may choose. All or nearly all bottoms are cut from like patterns to fit a foot of any shape, but invariably from the dried skin of the harp seal, the drier and older the better, since they stand more wear the older they are. The pattern of the sole is an oblong oval, while the tongue or top piece is more or less lance shaped. After soaking over night in water to soften it, the sole is taken and the whole edge for about an inch and a half is bent inward; then the toe is puckered in creases, as is also the heel, while the tongue fits the space left after the boot leg is temporarily fastened on, all the pieces overlapping enough to allow for sewing. These puckerings are made by simple creases of the needle at the time of sewing. All seams are made—if the sewing is done in a skillful manner, and not simply to sell the boot—by the simple overlapping of the two pieces and sewing each edge tightly to the part beneath, while the ridge thus made by the seam, if rubbed with a piece of wood, shoemaker fashion, will be hard and shiny as well as very tight. In all sewing the skin is so thick that the needle can be run through it and out the same side without perforating the skin; thus a seam admits no water through the sewing if the thread and overlapping pieces are drawn tight. The upper border of the boot leg has a doubled piece of cloth sewn around its edge, though sometimes sealskin replaces it, through which a piece of tape or braid of any color to suit the wearer, about a yard and a half long, is threaded, and the skin being quite flexible when on the foot is drawn tightly about the leg, the braid wound about twice and tied with the string end hanging outward. This secures the boot firmly and yet not painfully to the foot by the leg, and, though the string often gets loose and the boot leg often slips down, it seldom gives much trouble to the wearer. A noteworthy operation that might escape one's attention, as well as a curious fact in connection with this operation, is that the puckerings of the heel are held together by running two, three, or four small threads at about equal distance from each other, the stitches being taken through the bend in the creases on the inside of the boot from side to side around the heel, where they are drawn tight and fastened to the seam above; another fact is that the creases of the toe are not thus fastened."¹

The types of the Eskimo foot wear are:

1. The straw shoe or stocking, between Bering Strait and Kadiak.
2. The moccasin-shaped low shoe.
3. The moccasin sole with boottee top.

¹W. A. Stearns, "Labrador," Boston, 1884, pp. 162, 163. The boots of the east Greenlanders are of similar make, and are described by Holm and by Nansen, "First Crossing of Greenland," II, p. 272 et seq.

4. Boottee with sole; vamp and legging separated from the sole by one or more bands or welts of different color and width.

5. Crimped soles united immediately to the seal or other skin tops. These are winter boots.

6. Waterproof boots with crimped soles united immediately to the vamp and quarter. These two parts are joined, sometimes with a seam on one side and sometimes with a seam on both sides, and above the vamp and heel piece are tops, and sometimes extension tops, either of waterproof or of white sealskin.

7. Double boot (outer boot with crimped sole united to a long leg of sealskin or deerskin with the hair side out and inner boot or stocking with the hair side in toward the foot).

Where the Eskimo have been in contact with the Russians, the whalers, and with the Scandinavians, various foreign elements have been introduced, as the welt in the seams, additional strips and decorative piping between the different parts, and the addition of bead work and fine embroidery on the surface. While certain elements and materials characterize various culture regions, the going about of the Eskimo themselves and the acculturations above mentioned have greatly mingled the characteristics of the foot wear.

On leaving the Eskimo region in America and traveling southward one passes from the land of sealskin foot gear into that made from the dressed hides of land mammals. This class of foot wear goes by the generic name of moccasin, from an Algonquian word having a similar sound. Some features of the moccasin may be seen in Eskimo land, and Eskimo features will appear in Athapascan and Algonquian shoes especially; so also on the south border of the moccasin areas there is no sharp line dividing it from the sandal and the bare foot.

Moccasins have their dispersion in those areas of North America where the great mammals were in abundance, and where the ground was adapted to their usage. The people were ever on the move. In the Canadian region where the caribou was the prevailing mammal and no good thick hide could be found for soles, the shoe was cut from a single piece. The eastern Canadian Indians cut the skin from the heel of a caribou or moose with extensions above and below, for the leg and the foot of a rude moccasin, called *botte sauvage*.

The land of the buffalo and of the elk, because of the quality of the hide and the exigencies of region, occupation, and climate, had another set of types.

On arriving in the cactus country the Indian had to guard his feet and his legs as well, and found in the ample folds of an entire deerskin for each foot, and a thick sole well turned up in front, the protection he needed. The patch of leather on the Mexican sandal lacing is for the same end. In point of fact there were and are three principal classes or species of the moccasin:

1. The Athapascan type, a soft gaiter coming well up on the ankle,

made of a single piece with decorated tongue in front, lapels of flannel and buckskin over the lacing behind, and the gaiter top. Found in Canada and on the west coast.

2. The low, much decorated slipper moccasin of the plains and of the United States east of the Rockies, with endless tribal varieties.

3. The boot, with long top to wrap about the limbs.

There were, in addition to the environmental suggestions, fashions of moccasins that were purely tribal. For instance, among the Siouan tribes the Ponka moccasin sole was nearly symmetrical, broad across the ball of the foot, and bluntly pointed in front. The Omahas made a moccasin the sole of which was almost straight along the inside of the foot and pointed like our latest fashion, while the Pâni style was curved very irregularly along both edges and sharply pointed. But styles were mixed from tribe to tribe.

Moccasins were generally made in summer, since the hides of buffalo slain during that season were without thick hair. In the making the women pulled out the hair, as they did in the manufacture of leggings. They were cut out by a pattern, made over a rude last, and sewed with thread made of sinew from the leg or the fiber from the muscular fasciæ of the back and the shoulder. Before the introduction of beads dyed porcupine and bird quills were employed in ornament, and it is worthy of notice that now the old patterns are repeated faithfully in beadwork. The making of the moccasin is a matter of ethnical and geographical study, as will be observed in the drawings and descriptions. They are white, yellow, brown, black, or green; they are very low, with margin turned down, or fitted closely to the foot; they are plain or covered with symbols of totemism and mythology; they have trailers differing in pattern, number, and length. In a region so vast as all Canada south of Eskimo and all the United States excepting the southwestern corner, the resources and exactions of nature would in the same tribe effect many varieties and styles.

Commencing at the far north, example No. 7613 is a pair of moccasins of the Kutchakutchin Indians on the Yukon, consisting of three parts, the covering of the foot, the tongue, and the heel (fig. 56.) The first-named piece is cut out in rectangular form, mitered in front and the two edges sewed together or joining a tongue piece. In the heel the two edges are brought together and sewed downward about 3 inches, then for the rest of the way the leather is doubled so as to form a T-shaped seam, and this provides for the flattening out of the sole. The tongue, like that of a modern shoe, is sewed in with a piping, but the heel curtain is here omitted from the margin of the shoe. The edge of the bottom of the heel is cut off square and leaves no trailers whatever. No 1336, collected by C. P. Gaudet (fig. 57), is similar to this, excepting on the top of the shoe a piece of white leather or false tongue is added for ornament, and the seam gathered with beautiful quill work of red and blue. Also on the back of this example the inserted leather hangs an

inch below the seam like a curtain and is cut out neatly into a castelated ornament. Length of foot, $10\frac{1}{2}$ inches; height of boot, 9 inches. Collected by W. H. Dall.

Example No. 166964 is a shoe of the Athapascan form worn in the interior of Alaska on the Yukon, described also under No. 1336, but to the bottom of this Indian moccasin is sewed a thick sole, made of sennit constructed out of old manila rope, frayed and braided after the manner of the Tibetan shoe No. 131198. The union of the Indian moccasin with the Chinese and Tibetan sole in the same specimen is an excellent example of the way in which one people borrow the inventions of another. This shoe is evidently an adaptation made by an American sailor or by a Chinaman recently living in Alaska. Length, $10\frac{1}{2}$ inches. Collected by J. H. Turner.



Fig. 56.

MOCCASIN OF KUTCHAKUTCHIN INDIANS, ALASKA.
Cat. No. 7613, U. S. N. M. Collected by William H. Dall.

In winter, according to Mackenzie, the dress of the Chippewyan is composed of the skins of deer and their fawns, dressed as fine as any chamois leather in the bair. In summer the same, except without the hair. Their shoes and leggings are sewed together, the latter reaching

upward to the middle and being supported by a belt, under which a small piece of leather is drawn, the ends of which fall down both before and behind. In the shoes they put the hair of the moose or reindeer with additional pieces of leather as socks. The shirt or coat when girted around the waist reaches to the middle of the thigh, and the mittens are sewed to the sleeves or are suspended by strings from the shoulders. A ruff or tippet surrounds the neck, and the skin of the head of the deer forms a curious cap.



Fig. 57.

MOCCASIN OF ATHAPASCAN INDIANS, ANDERSON RIVER,
NORTHERN CANADA.

Cat. No. 1336, U. S. N. M. Collected by C. P. Gaudet.

A robe made of several deer or fawn skins sewed together covered the whole. This dress is worn single or double, but always in winter the hair within and without. The dress of the women differs little from that of the men.¹ The U. S. National Museum, through the kindness

¹ "Mackenzie's Voyages," pp. cxv and 120-122.

of R. MacFarlane, B. R. Ross, Robert Kennicott, C. P. Gaudet, and others, possesses a number of rare specimens of this shoe, stocking and long legging all in one piece, made of excellent tawed caribou skin and richly decorated with beadwork.

The Carriers (Athapascans) of Stuart Lake, British Columbia, originally wore a moccasin of elk skin (*Cervus canadensis*). But the poorer classes made shoes of untanned marmot skin, or even of the skin of the salmon. They are now of dressed caribou or of moose skin among the Carrier and the Tse'kéhne and of deerskin among the Tsilkoh'tin.

These tribes went barefooted in rainy weather, the women and children still adhering to the custom. No Carrier would now undertake a journey without the traditional moccasins.¹

The Nascoopi Indians of Labrador, contiguous to the Eskimos, have

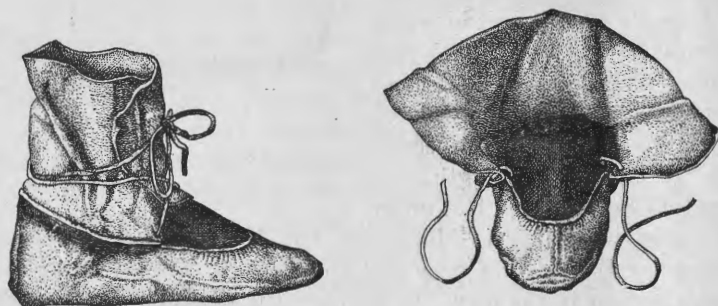


Fig. 58.

MOCCASINS OF NASCOPI (ALGONQUIAN) INDIANS, LABRADOR.

From a figure in Turner's "Ethnology of the Ungava District, Hudson Bay Territory," Eleventh Annual Report of the Bureau of Ethnology.

Cat. No. 90062, U. S. N. M.

been studied by Lucien M. Turner, who sent to the U. S. National Museum examples No. 90062 and 90063. According to Mr. Turner the deer-skin moccasin is thus constructed: "The footing is cut out first in the shape of a parallelogram; the edges are then turned up and creases made around the part that covers the front of the foot. The puckers are held in position by a stout sinew thread run through each one and around from side to side to prevent their 'bagging' over the toes. The sides of the footing and the heel are not creased, as the heel seam takes up the slack." The heel seam is T-shaped, the horizontal portion resting on the ground. In the example figured by Turner there is no "trailer." At the tip of the toe there is, contrary to Athapascan fashion, a T-shaped seam also (fig. 58). This mark has a curious distribution and may be of little account. The tongue or upper is sewed to the edges of the creases on the sole or bottom portion, but between the upper and the sole oftentimes a narrow welt or piping of skin or

¹ A. G. Morice, "Notes on the Western Dénés," Trans. Canadian Inst., IV, p. 163.

cloth is inserted. The superfluous edges of the sole are then trimmed off and the gaiter top is sewed on. This is a long, narrow strip of inferior skin of sufficient size to overlap in front and come well above the ankles.

Just below or at the margin of the top a long thong of reindeer hide is inserted through several holes, which allows it to pass around the heel and below the ankles, bringing the ends in front over the tongue. One end of the top is carefully laid over the other and wrapped round by the ends of the thong.

Certain portions of the hide make better foot wear than others. The neck is too thick and stiff to crease, but is useful for tongues; the flanks are too thin. The sides of the hide are useful for bottoms; the flanks and back, scarred by grubs, serve for tops and strings.

For wear about the tent the gaiter top is omitted and a slipper moccasin worn, which is held on the foot by means of a drawstring. This low form is adopted largely among the Canadian white population.

A single deerskin will make five to seven pairs of moccasins for an adult, and as they last but two or three weeks as many as fifteen to twenty-five pairs are necessary for each.

The Nascopi are of the Algonquian family, and the chief characteristics of their moccasins may be expected in all the tribes of the United States east of the Mississippi and north of the thirty-fifth parallel.

The moccasin of the Iroquois, ah ta qua o weh, was made of deerskin. In the modern moccasin the front part is worked with porcupine quills, after the ancient fashion, while the lapel which falls down upon the sides is embroidered with beadwork, according to the present taste.

The legging, giseha, which was fastened above the knee and descended upon the moccasin, was also made originally of deerskin and ornamented with quill work upon the bottom and side, the embroidered edge being worn in front. In later times red broadcloth, embroidered with beadwork, has been substituted for deerskin in most cases. Much ingenuity and taste were displayed in the designs and in the execution of the work upon this article of apparel. The warrior might well be proud of this part of his costume.¹

Of the tribes west of the Mississippi, Carver says that the shoes of the Naudowessies are made of the skin of the deer, elk, or buffalo; these, after being sometimes dressed according to the European manner, at others with the hair remaining on them, are cut into shoes and fashioned so as to be easy to the feet and convenient for walking. The edges round the ankle are decorated with pieces of brass or tin fixed around leather strings about an inch long, which being placed very thick, make a cheerful tinkling noise either when they walk or dance.² In point of fact during the good old days of the buffalo the Sioux moccasin of the trail and the hunt was chiefly of buffalo hide. The

¹ Lewis H. Morgan, "League of the Iroquois," 1851, pp. 263-265.

² Carver, "Three Years' Travels," Philadelphia, 1796, p. 146.

large proportion of Indian foot gear exposed for sale in the last few years have been made by the women of this stock. A full set from any one tribe includes very many designs. There seems to have been no collector who gave attention to completing such sets. The U. S. National Museum is rich in Sioux material, but has nothing near a perfect series from any Sioux tribe.

Example No. 8535 is a modern Sioux moccasin, consisting of a sole of rawhide and upper of dressed buffalo hide all in one piece, the only seam being at the back. The sole is a piece of an old pemmican case, showing the paintings in green and red, attached to the upper by whipping along its margin so as to leave the lower half of the margin projecting downward and raise the upper above the ground. The tongue is a separate piece. The ornamentation consists of a tribal symbol in blue, green, yellow, red, and white beads sewed on separately. A lacing of buckskin thong passes through slashes around the heel and ties in front of the instep. The trailer is two strings close together, about an inch and a quarter long. Length, 10 inches. Collected by S. M. Horton, U. S. A.

Example No. 152855 is a pair of moccasins belonging to the Kiowa Indians and collected by James Mooney, of the Bureau of Ethnology. The uppers are of soft leather, dyed blue, and ornamented with beadwork and cut fringe. The fringe is a marked character on the Kiowa moccasin. The sole is of hard rawhide sewed on with sinew. Mr. Mooney says that the tongue in the moccasin, and the long, fringed trailer are worn by both Kiowa and Comanche (Shoshonean stock).

Example No. 165811 is an Arapahoe moccasin, consisting of a separate sole of rawhide, cut from an old parfleche case, and an upper made of a single piece of buckskin. The manner of attaching the upper to the sole should be observed: The margin of the thick sole is split for a little way all around, and the margin of the buckskin upper is attached to that portion of the border of the sole that is above by whipping; in this way the stitching does not come in contact with the ground, but the sole stands off as in a regular shoe; in fact, by splitting the margin of the sole the Arapahoe Indian woman has provided herself with a quasi welt. This same process of splitting and sewing is shown in an interesting manner in a California shoe figured in the report of the Ray collection. The only seam that appears in the upper part of the shoe is at the heel, from the bottom of which extend two long trailing strings close together. The lacing is of rawhide thong passing through slashes between heel and ankle. The tongue of the moccasin is sewed on separately, and for ornament there are three rays of blue, red, yellow, and white beads. Length, 10 inches. Collected by James Mooney. Compare the Sioux example, No. 8535, above described.

Lieutenant Abert, U. S. A., describes the Cheyenne moccasin as made of buffalo hide dressed without the hair, the fronts ornamented with beadwork. This moccasin has only one seam; that is on the outer side

of the foot, the material being doubled over and made to fit. But it will be seen that this style of seaming is in use with the Nez Percé and the Shoshone. The inside line is perfectly straight, as among the Omahas and some Poncas. Another style is of antelope skin and has trailers attached to the heel. Abert says that these are worn by horsemen and that the Cheyennes believe the trailer to be a protection from the rattlesnakes.

Examples 6987 and 6988 are buckskin moccasins made in one piece, cut out so that the seams extend down the back of the heel and over the top of the foot, with puckering. This form of moccasin is peculiar to the Caddo of Texas. Collected by Edward Palmer.

Frequent reference is made in this paper to the "trailer," or *hiⁿ-be-ga-ceg-che*, of the Sioux. It consists of one or more little rawhide strings about an inch long trailing behind the heel of a certain type of Indian moccasin. When the woman cuts out the skin for the shoe she leaves hanging on the edge of that part which forms the horizontal seam at the bottom of the heel the little tags, strings, or tassels that will form the trailer. Each tribe had a different number and order of this part, so that a good scout is said to have been able to tell the tribe to which an Indian belonged by the mark of his trailer in the snow. Mr. Dorsey once told the writer that the Omahas had a habit of omitting or disguising the trailer as a part of their strategy in war. For many examples of the low, beaded moccasin of the East, Catlin's and other works should be consulted.

Turning away from the Atlantic to the Pacific drainage, it will be necessary to commence at Mount St. Elias. The Kwakiutl and other tribes of the British Columbia coast go barefooted the year round, according to Boas. This might be declared of all primitive maritime peoples in regions where the want of warmth did not stimulate the invention of waterproof foot gear. In maritime Europe the sabot lifts the foot above the wet sand and mud. This maritime or barefooted region stretches from Mount St. Elias to the Columbia River. It is the home of the Koluschan, Skittagetan, Chimmesyan, Wakashan, and coast Salishan families; the route of the Pacific gulf stream; the region of abundant sea food and great forests; the culture region of the great dugout canoes.

Example No. 20797 (fig. 59) is a moccasin from Sitka, consisting of three pieces—the footing, the vamp, and the leg piece. The sole is probably of soft elkskin cut into long rectangular form and rounded in front. In the rear two wedge-shaped gores are cut out at the corners, leaving a right trapezoid extending as in a dovetail. When the two edges of the rear are brought together they are doubled so as to form a T-shaped seam and the trapezoidal piece extends outward to form the trailer of the shoe. The horizontal seam of the T provides for the flat sole, and the vertical part provides for the extension of the material well up around the heel and the front of the foot as in an ordinary

slipper. The front of this shoe is gathered and puckered so as to cover the ends of the toes and the margin of the foot. The vamp or back piece is sewed to the margin of the footing and extends well upward on the leg; the seam connecting this with the sole, and also the two edges of the sole in the rear, have inserted between them a narrow piece of buckskin acting as a piping. The heel portion of the leg is whipped on to the upper margin of the sole in such a way that a small portion of it extends below the seam like a lapel. The vamp and the heel piece extending well up on the leg are wrapped around it and held in place by cord or some kind of a garter. Length, $10\frac{1}{2}$ inches. Collected by J. G. Swan.

Example No. 23854 is a pair of moccasins said to have been worn by a Nez Percé Indian, consisting of two parts; that which covers the foot and a short legging around the ankle. The body of the shoe is

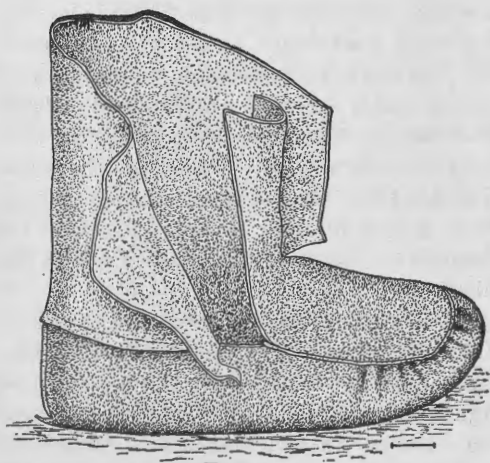


Fig. 59.

ATHAPASCAN TYPE OF MOCCASIN, FROM SITKA, ALASKA.

Cat. No. 20797, U. S. N. M. Collected by J. G. Swan.

made of a single piece of hide cut out like the finger of a glove, sewed around the toe and along the outer margin of the foot to the heel where the two edges of the rear end of the pattern are sewed together to form the upright portion of the heel and also a horizontal seam with trailers at least $1\frac{1}{4}$ inches apart. The upper border or legging is sewed on to the upper margin of the shoe, and a portion of the leather of the shoe extends backward to form a tongue. The top of the foot is ornamented with beadwork in white, black, and blue beads. Around the ankle is a strip of red flannel ornamented with blue and white beads. The strings are formed of buckskin thong. The formation of this shoe should be especially observed, as it differs from those in the regions about in the manner in which the seam is carried around from heel to great toe. Length, 10 inches. Collected by J. B. Monteith.

Example No. 673 is a pair of shoes from the Chinook Indians at the mouth of the Columbia River. This shoe consists of three parts—the sole, the upper, and the legging. The sole is of thick rawhide and sewed on to the upper by a series of blind stitches, just as in a modern, cheap slipper or eastern moccasin. The upper is of buckskin and has only one seam at the back. At the lower end of this seam is a trailer, in which a single rawhide string, one-eighth of an inch wide, is

supplied nearly all the way. The upper is extended into a long tongue, passing to the top of the legging. The legging is a band of buckskin about 4 inches wide, sewed to the top of the upper. The shoe string passes through slashes in the upper on either side of the heel, and at the instep as in the Athapascan and after passing once or twice around the ankle, is tied in front. They are ornamented by beadwork in red, white, green, blue, and pink beads. The designs are entirely European. They are rights and lefts. Length, $9\frac{1}{2}$ inches; height, 7 inches. Collected by George Gibbs.

The moccasin of the Shoshone is of the deer, elk, or buffalo skin, dressed without the hair, though in winter they use the buffalo skin with the hair side inward, as do most of the Indians who inhabit the buffalo country. Like the Nez Percé moccasin, it is made with a single seam on the outer margin and sewed up behind, an opening being left at the instep to admit the foot. It is variously ornamented with figures wrought with porcupine quills, and sometimes the young men most fond of dress cover it with the skin of a polecat and trail at their heels the tail of the animal.¹

Example No. 165147 is a Shoshone moccasin, from Wyoming, made of smoked deerskin. As described by Lewis and Clarke, this specimen, collected by James Mooney, is all in one piece, with the seam at the side, instead of having a separate sole like the moccasins of the prairie tribes. Example 165148 from the same tribe has the T-shaped seam on the toe. Example 22018 is a buckskin moccasin made in one piece cut out so that the seam extends down the back of the heel and around the outer margin of the foot quite around the toes. The edges are sewed together with a piping in the seam. Short tongue sewed on as in a modern slipper, lacing through slashes about the heel. Long trailers from seam, and short ones from horizontal seam of the heel. Length, $9\frac{1}{2}$ inches. Wind River Utes, collected by Major J. W. Powell.

The shoes of the Hupa (Western Athapascan) and of the other Indians of northern California are made high like gaiters and are cut from a single piece of buckskin sewed up at the back rather carelessly by a buckskin cord, as in basting. Down the instep a curious seam is formed as follows (fig. 60): The two edges of the leather are slightly

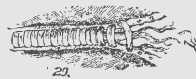
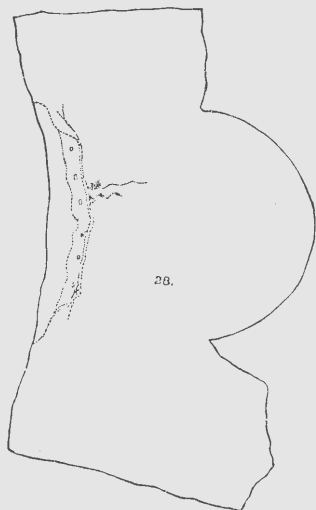


Fig. 60.

PATTERN AND BLIND STITCHING OF HUPA MOCCASIN.

¹"History of the Lewis and Clarke Expedition," 1893, 11, New York, pp. 564-568.

split. They are then brought together as in joining the edges of a carpet. A loose cord of sinew is laid along the two edges and a whipped stitching of sinew made to join the two inner margins of the edges of the buckskin, inclosing at the same time the loose cord of sinew.

When the shoe is rounded out, the two outer margins of the leather come together on the outside of the shoe and conceal the sewing altogether. A coarse sandal of the thick portion of the elk hide or of twined matting is worn by some tribes (fig. 61), and also a nicely woven legging of soft basketry. The latter, however, belong to full or ceremonial dress.¹

Example No. 24079 (fig. 62) is a sandal of rushes worn by the Klamath Indians of northern California (Lutuamian family), collected by L. S. Dyar. It is only half finished, and shows the method of construction.

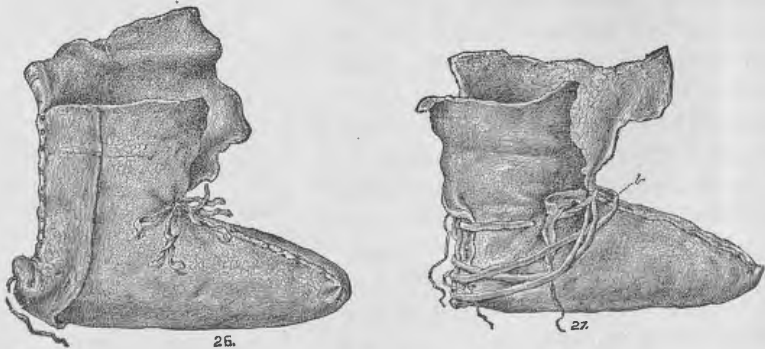


Fig. 61.

MOCCASINS OF CAHROC AND HUPA INDIANS, NORTHERN CALIFORNIA.

Cat. Nos. 21437 and 79197, U. S. N. M. Collected by Stephen Powers and Capt. P. H. Ray, U. S. A.

The foundation is laid on eleven twine warp strands, as in the Japanese sandal of thread, spreading apart toward the toes. The weft, however, is in twined weaving, and the work is carried up to cover the toes as in a light slipper, as will be seen on Korean and Chinese examples. Along the margin of the sole loops have been left, as in the Asiatic specimens figured and described.² Especial notice must be taken of this specimen occurring in northern California because it is the first intimation at the north of the sandal, which will a little later on usurp the place of the moccasin.

Example No. 9549 (fig. 63) is a pair of Navajo moccasins from New Mexico (Southern Athapascan), consisting of three parts—sole, vamp, and heel. The sole is of rawhide turned up in front of the great toe and about the foot for a half inch or more around the entire margin.

¹ Mason, "The Ray Collection from Hupa Reservation," Rep. Smithsonian Inst., 1886, p. 210.

² *Ibid.*, pl. VI.

The vamp is of brown deerskin, or smoke-cured deerskin, very neatly sewed to the margin of the rawhide sole all the way around, and the stitches are all finely puckered. This work is suggestive of the Eskimo shoemaker. The heel (or what is commonly called the quarters and legging) consists of a broad strip of buckskin attached to the sole back of the arch of the foot, having a long, wide flap which passes from the inner side of the foot across the instep, and is buttoned at the ankle on the outside. No. 9550 (fig. 64) is of the same character, excepting the quarter piece is fastened with a thong rather than with buttons. Length, 10 inches. Collected by E. Palmer.

It is worth noticing, in passing, that the gaiter tops of the Navajo, who are Athapascan, is here modified to a modern style, and that the soles are of such primitive fashion that they may be said to stand for the first of all rawhide foot wear. The Apache boot, as a protection against the thorny plants of their desert country, resembles the classical *endromis*, figured in the third edition of Smith's Dictionary. But it is after all the Athapascan legging and moccasin, combined with the addition of a rawhide sole having a broad point turned up in front. Now, the Apache is also an Athapascan. The long seam down the inside of the leg is made by turning one margin down for half an inch, laying the other margin against the crease and whipping the doubled and the single edge together with sinew thread. For attaching the upper to the sole the raw edge of the former is doubled, the upper margin of the latter is beveled, the two are whipped together, and then the sole projects outward to conceal and protect the seam.

The following types of moccasins may be noted:

1. Athapascan type, with gaiter or extension top. Footing of one piece, with seam at the heel and straight up the back or top of the foot to an ornamental tongue piece. The extension top is sewed to the footing so as to extend downward in a curtain to conceal the lacing.

2. Tlingit type, like the Athapascan, but without seam in front, the tongue piece covering almost entirely the back of the foot. Top not extending downward to cover the lacing. Trailers are present.

3. Algonquian type, very similar to the Athapascan, but having a cross seam in front of the toes, meeting the seam from the front of the tongue piece. These three forms merge into the Eskimo at the north and the low moccasins at the south.

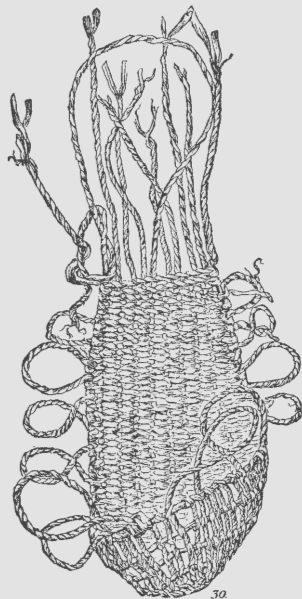


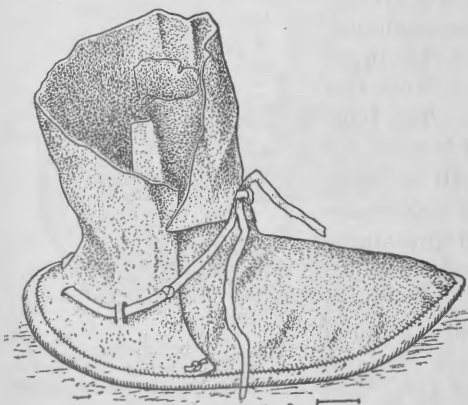
Fig. 62.

WOVEN GRASS SANDAL OF KLAMATH
(LUTUAMIAN) INDIANS, NORTHERN
CALIFORNIA.

Cat. No. 24079, U. S. N. M. Collected by Capt.
P. H. Ray, U. S. A.

4. Iroquoian pattern. Footing slipper like, with lapels at the side; embroidered. The tongue piece is set into the puckered border of the footing. In modern examples linings are introduced.

5. Siouan pattern. In recent times with rawhide sole, beaded top, and lapels. The Shoshonean variety of this type has a seam from the heel around the outer margin of the foot, quite to the inside of the great toe, and this was doubtless the earlier Siouan form. Frequently heavy buckskin fringes adorn the heel seam and the top of the foot.



Figs. 63 and 64.

MOCCASINS OF NAVAJO (ATHAPASCAN) INDIANS, NEW MEXICO.

Cat. Nos. 9549 and 9550, U. S. N. M. Collected by Edward Palmer.

between the first and the second toe, and the older, aboriginal, and now quite disused type having a toe loop or two toe strings, one between 1 and 2, the other between 3 and 4. Through the courtesy of Prof. F. W. Putnam, Mr. Marshall Saville, and Mr. Stewart Culin, I am able to extend the rather meager collection of the U. S. National Museum.

Example No. 13013, Museum of the University of Pennsylvania, is a sandal from the cliff dwellings of Arizona. It consists of sole, lining, and lacing. The sole is in yucca leaves, diagonally woven or plaited six ply. On top of the sole is an insole or lining of corn husk.

6. Desert type. Found in the Great Interior Basin from Utah to Mexico; characterized by a heavy rawhide sole turned up in a peculiar manner to protect the end of the great toe from thorns.

7. The Caddoan type. Gaiter form, with straight seam all the way up the heel and entirely across the top or back of the foot, with seams often elegantly puckered on the toes.

At this point it is necessary to make an abrupt stop on the borderland of the Spanish territory. Passing the moccasin, the student arrives at the land of the sandal, just on the southern boundary of Colorado and Utah. Here he encounters two radically different types of sandal, the one now in common use throughout Latin America, having, as in Japan, a single toe string

The lacing consists of a series of loops around the margin of the sole, through which a tie of yucca string passes, as in the Indian cradles and sleds. The heel loops pass from two of those before mentioned around the heel and down to the sole under the ankle. (Pl. 5, fig. 1.) Sandals from the Kentucky caves should be studied in this connection.

Example No. 12155*b*, in the Peabody Museum, is a coarse sandal of yucca fiber, collected by Edward Palmer in an abandoned camp in Utah. It is in the form of an openwork slipper, made up of a fore-and-aft warp held in place by nine rows of cross-twined weaving at varying distances apart. The lacing is gathered into the outer margin of the sole. The Utes are adepts at the twined basketry, and in this example possibly have attempted to imitate a low shoe or moccasin after their own fashion. (Pl. 5, fig. 2.)

Example No. 22192, in the U. S. National Museum, is a sandal from Yezo, worn by the Ainos, and here introduced for comparison with American examples, devoid of toe strings and fastened on entirely by lacing through loops on the side and heel loops. (Pl. 5, fig. 3.)

Example No. 12155*c*, in the Peabody Museum, is a sandal of yucca fiber found in an old Ute camp. It is much dilapidated, but shows elements of twined weaving, side loops, and cross lacing. Inside is stuffed an old rag, part of a knit stocking. (Pl. 5, fig. 4.)

In an old abandoned camp in southern Utah, in the cedar forests near Mount Trumbull, Edward Palmer found a number of Pah-Ute sandals which, by the kindness of Professor Putnam, I am privileged to describe. All of them are of yucca fiber, and are as coarsely made as sandals can be. Two of them, examples Nos. 12155*a* and 9439, are of Asiatic pattern, and two of them are in coarse-twined weaving. These will be better described.

Example No. 20929, U. S. National Museum, is an old sandal from Utah, made of coarse yarn of yucca fiber, woven on a warp of two strands of the same material in figure of 8 pattern, the loose ends always left underneath. The toe strings that projected from the end of the sole are gone, and there is left of the lacing only the loop that encircled the heel. (Pl. 6, fig. 1.)

Example No. 12155*a*, in the Peabody Museum, is an extraordinary specimen. The double warp is the same as in fig. 4 of this plate, and so is the heel covering and overtoe lacing arrangement, but there is in addition a series of loops on the side between the toe and the ankle as in other sandals. We have here a combination sandal, all the elements of which are to be seen in the Japanese types. (Pl. 6, fig. 2.)

Example No. 128173, U. S. National Museum, precisely similar to example No. 116211, figured and described on page 331 of this paper, is here introduced for comparison of the overtoe string, lugs on the sides, heel loops, and especially the wicker weaving. All loose ends

are in this shaved off on the bottom. This specimen was presented by the Japanese department of education. (Pl. 6, fig. 3.)

Example No. 9439, in the Peabody Museum, is a sandal from southern Utah, built after one of the Japanese patterns. A coarse bundle of yucca fiber 3 feet long is doubled in the middle, and on this as a warp the sole of the sandal is woven from other bundles in a figure of 8 wickerwork, the coarse ends always appearing underneath. At the heel the fiber is wrapped around the bend of the warp. The sole is 9 inches long. At the tip the two ends of the warp are tied in a single knot, the remainder serving as lacing. For heel and instep strap a bundle of twisted fiber 2 feet long is doubled in the middle back of the heel, the two ends drawn down and passed inside the warp strands beneath the ankle and are then brought up over the instep and tied. The lacing is attached to this, but passes over the toes instead of between them, just as in some Eastern examples. (Pl. 6, fig. 4.)

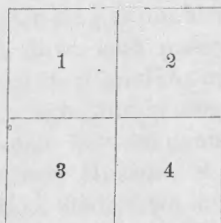
Example No. 22717, Peabody Museum, is a child's sandal from Acatita Cave, Coahuila, Mexico, made from unshredded yucca leaf. The warp is a leaf bent in the middle, the two ends projecting at the heel and shredded. The weft is a very coarse wicker of yucca leaf. The whole is bound together by a leaf brought up through the sole near the heel (*a*), down again near the toes (*b*), forward and up around the front, spliced through itself at *b*, under the sole and spliced through itself at *a*. The two toe strings have their front ends tied together in a square knot underneath, are spliced through the binding piece to go between toes 1 and 2, and 3 and 4, are attached to the margin under the ankle, and then pass up and around the heel in the usual manner. (Pl. 7, fig. 1.)

Example No. 45610*a* is a sandal from Mexico. It is built upon two yucca leaves bent double in front, the one overlying the other. In each, the under half is warp; the upper half is doubled down on top and used to strengthen the whole. The toe strings inclose 1 and 2, and 3 and 4, and do not cross on the back of the foot. Heel strap missing. (Pl. 7, fig. 2.)

Example No. 45610, U. S. National Museum, is a child's sandal from a cave near Silver City, N. Mex. It is in figure of 8, or wicker weaving on two-warp filaments. All lashing is absent. (Pl. 7, fig. 3.)

Example No. 22833, in the Peabody Museum, is an old sandal from Coyote Cave, Coahuila, Mexico. In this specimen the yucca warp is carelessly laid along and held together by means of cross sewing with the same material. On top of all a spliced wide leaf occurs, as in figs. 1 and 2. A neat two-ply cord forms the toe string, doubled in the middle, rove through the fabric near the front, so as to go between toes 1 and 2, and 3 and 4, back to the sides of the sole under the ankle, where the ends pass through the heel string and are fastened off with a single knot. The heel string is a very pretty piece of square plaiting, as in whip lashes. Its ends are attached to the ends of a separate twine

EXPLANATION OF PLATE 5.



SANDALS WITH MARGINAL LOOPS FOR LACING. CLIFF-DWELLERS OF ARIZONA.

Fig. 1. SANDAL OF YUCCA FIBER. Insole of corn husk and lacing of yucca strips. Lent by Mr. Stewart Culin.

(Cat. No. 13013, Museum of the University of Pennsylvania.)

Fig. 2. SANDAL FROM AN OLD CAMP IN SOUTHERN UTAH. The warp is of shredded yucca fiber and the weft in twined weaving of the same material.

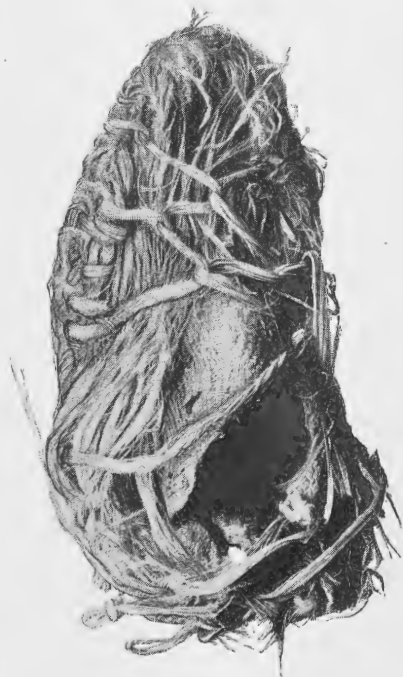
(Cat. No. 12155 (b), Peabody Museum, Cambridge, Mass.)

Fig. 3. SANDAL OF BAST FIBER WOVEN IN WICKER PATTERN. Lacing of straw, twined. (To be compared with fig. 1.) Worn by the Ainos of Yezo.

(Cat. No. 22192, U. S. N. M.)

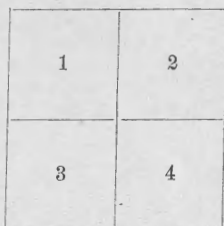
Fig. 4. SANDAL FROM SOUTHERN UTAH. This is similar to the specimen shown in fig. 2. Inside is a portion of a knit stocking in cotton yarn. The lacing is the same as that shown in the other figures of the plate. The specimen was found in an abandoned camp.

(Cat. No. 12155 (c), Peabody Museum, Cambridge, Mass.)



SANDALS WITH MARGINAL LOOPS FOR LACING.
Cliff-dwellers of Arizona.

EXPLANATION OF PLATE 6.



SANDALS WITH OVERTOE LACING.

Fig. 1. SANDAL OF SHREDDED YUCCA FIBER. Made on a warp of two strands. Southern Utah.

(Cat. No. 20829, U. S. N. M.)

Fig. 2. SANDAL OF SHREDDED YUCCA FIBER. Based on a string of the same material doubled, the ends of which, drawn over the toes, serve as lacings through the loops along the margin. The loop over the heel is of the same material.

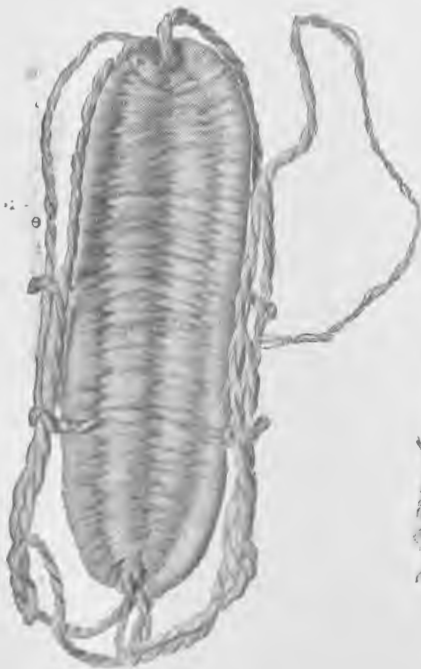
(Cat. No. 12155 (a), Peabody Museum, Cambridge, Mass.)

Fig. 3. JAPANESE SANDAL MADE OF STRAW. The foundation is a long twine of the same material, twice doubled, to form at its middle two loops extended at the heel and at its ends to constitute the lacing, which passes over the two toes, through the loops or lugs at the sides, through the heel loops and over the instep, where they are fastened. From the Japanese Department of Education.

(Cat. No. 128173, U. S. N. M.)

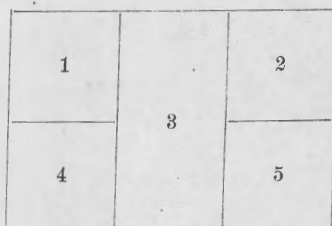
Fig. 4. SANDAL OF SHREDDED YUCCA FIBER. This sandal is built up, like those shown in figures 1 and 2, by wicker weaving on a warp of coarse twine of the same material, the ends of which form the overtoe strings. After being laced around the heel they are tied over the instep.

(Cat. No. 9439, Peabody Museum, Cambridge, Mass.)



SANDALS WITH OVERTOE LACING.

EXPLANATION OF PLATE 7.



SANDALS WITH DOUBLE TOE-STRINGS.

- Fig. 1. CHILD'S SANDAL OF YUCCA LEAF. This sandal is based on a **single leaf**, doubled. The wicker weaving is held together by another leaf **doubled** and spliced over all longitudinally. A lacing of strips of yucca leaves passes between toes 1 and 2, and 3 and 4. The heel band is **missing**. From Acatita Cave, Coahuila, Mexico.
(Cat. No. 22717, U. S. N. M.)
- Fig. 2. CHILD'S SANDAL. This specimen is of similar construction to that shown in fig. 1, but is much worn. No lacing is shown. Mexico.
(Cat. No. 45610 (a), U. S. N. M.)
- Fig. 3. CHILD'S SANDAL. This specimen is from a cave near Silver City, New Mexico, and is of the same material and construction as the specimen shown in the preceding figure.
(Cat. No. 45610, U. S. N. M.)
- Fig. 4. SANDAL OF SHREDDED YUCCA FIBER. The specimen is similar in original design to fig. 1 in warp, weft, and spliced binding, but it has been **much** worn and repaired. The lacing is of fine twine and braiding. It consists of the toe strings between 1 and 2, and 3 and 4. The heel strings are of braid, and the ankle strings of the same material. All of these are attached to one another just below the ankles. From Coyote Cave, Coahuila, Mexico.
(Cat. No. 22833, Peabody Museum, Cambridge, Mass.)
- Fig. 5. SANDAL FROM A MUMMY. Constructed precisely like the specimen shown in fig. 4, and found in the same cave.
(Cat. No. 22850, Peabody Museum, Cambridge, Mass.)



SANDALS WITH DOUBLE TOE-STRINGS.

rove through the fabric of the sole, the latter being tied with the clove hitch. (Pl. 7, fig. 4.)

Example No. 22850, Peabody Museum, is a sandal from a mummy in Coyote Cave, Coahuila, Mexico. This example shows very clearly the carelessly laid warp and the cross weaving and sewing, which are doubtless repairs of a much worn sandal. The toe string in this case is continuous, passing between 1 and 2, and 3 and 4, back through the sole; the ends make half hitches and are continued to form the heel string. (Pl. 7, fig. 5.)

The sole of the cliff dweller's, the Utah man's, the New Mexican mound and cave man's sandal, as may be seen by the plate, is of vegetal fiber, Indian hemp (*Apocynum*), yucca of many species, and henequen, sisal, or agave (*Ixtli*).

For the most part, they are rights and lefts, but not a few of them that are built on a warp are quadrilateral.

In texture, they are either in corded weaving, with warp and weft variously treated; or if the material be coarser, they are in wickerwork, or they are plaited or woven diagonally, but one and all have a toe loop or string that pierces the sole in two places and passes up between toes 1 and 2, and 3 and 4. This forms the basis of a lacing, and is variously treated, but a description of the figures will make the matter perfectly plain.

Example No. 13014 is from a cliff dwelling in Arizona. The warp and weft are of a fiber strongly resembling that of *Apocynum cannabinum*. The weft is finely spun, laid close, colored in narrow stripes, and on the under side the meshes are caught into a continuous loop or coil of coarser thread, making that part more durable. At the front the projecting ends of the warp are concealed in a continuous braiding of a single thong of buckskin. Two perforations show where the toe loop came through. Unfortunately, this part is wanting, but the rest of the lacing down to the ankle loops and up over the heel, returning to the knot on the instep, make the whole treatment plain. (Pl. 8, fig. 1.)

In the collection of Mrs. T. T. Childs, of Washington, is a sandal woven in wicker pattern from a two-ply twine of *Apocynum*. The heel strap and lacing are administered precisely as in fig. 1, but the loop in front of agave fiber, twined, seems to have included the first and second toes. This is an uncommon form of toe loop. The under side of this sandal also is worthy of study, for the weaver has tied single knots in her cord all around the under margin, and also at proper places under the heel and under the ball of the foot where the strain would come. This ingenious device stands for the hobnails in peasants' shoes of more advanced peoples. The selvage of the Childs specimen is formed by an ingenious turning in of the twines in the course of the weaving or plaiting. A woven heel also is somewhat turned up.

Example No. 13015 is from a cliff dwelling in Arizona and is perfect in all its parts, which are four—the sole, the toe loop, the heel loop,

and the lacing. The sole is of yucca leaf (*Yucca angustifolia*) woven or plaited diagonally, and needs no explanation. The toe loop is a separate part, gathered at its ends into the texture of the sole, and is double. The heel loop is precisely like it, caught into the margin under the ankles and hooked over the heel. The lacing starts from the instep, and from this point makes three loops, to wit, about the toe string and about each side of the heel string, returning to the starting point, where it is knotted. (Pl. 8, fig. 2.)

Example No. 45609 is of yucca fiber coarsely plaited, from a cave near Silver City, N. Mex. All the lacing above is in one continuous string, starting on the back of the toes, passing down through the sole, and up, where a single knot is tied. The long end then makes an excursion to the ankle loops and around the heel, coming back to the single knot over the toes, where an additional square knot is tied. The treatment at the heel can not be made out, owing to the torn condition of the specimen. (Pl. 8, fig. 3.)

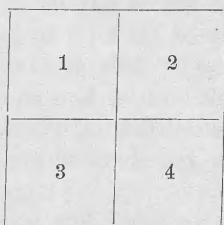
Example No. 13016, from a cliff dwelling in Arizona, is of shredded yucca fiber. The under side shows the structure better. There is a warp of four ropes, and the weft is woven into this like wicker, all the loose ends being purposely left long on top to afford a soft bed for the foot. The great majority of Japanese straw sandals happen to be woven in precisely the same manner, only in Japan the loose ends are cut off underneath. All the lacing is gone from this splendid specimen save the well-defined toe loop. (Pl. 8, fig. 4.)

Example No. 22716 in the Peabody Museum is a sandal from Acatita Cave, Coahuila, Mexico, an old and exceedingly interesting form. The thick sole is closely woven in twisted yucca fiber in checker pattern and the bottom is soaked in pitch or gum. There are two toe strings, knotted on top and passing between 1 and 2 and 3 and 4, crossed, perhaps, over the top of the foot, hitched into the sole at the margin below the ankle and passing behind the heel. This should be compared with example No. 10119. (Pl. 9, fig. 1.)

Example No. 22718 in the Peabody Museum is a substantial sandal from Acatita Cave, Coahuila, Mexico, made of yucca fiber, and loaned by Professor Putnam. The underside is shown in the photograph. The structure is a little obscure, but there seems to be a mass of fiber felted, and sewed together with coarse yucca yarn, long stitches beneath and short stitches above, precisely as on the compound soles of the Orient. The border is strengthened by stitching all round. The specimen is not ancient and may have been constructed under European motives. (Pl. 9, fig. 2.)

Example No. 22183 in the Peabody Museum is a sandal from Coyote Cave, Coahuila, Mexico, loaned by Professor Putnam. The outline is that of a modern round-toed shoe. The fabric is of yucca fiber, the warp laid along loosely in wisps, little twisted, but the loose ends are all underneath. This warp is held in position by a continuous boustrophedon twined weaving of two-ply string in crooked rows from half an

EXPLANATION OF PLATE 8.



SANDALS WITH STRINGS INCLOSING SECOND AND THIRD TOES.

Fig. 1. SANDAL MADE OF INDIAN HEMP. The specimen is closely woven after the pattern of California basketry. The toe string is missing. The heel string and lacings on top of the foot show the method of administration. From a cliff-dwelling of Arizona. Lent by Mr. Stewart Culin.

(Cat. No. 13014, Museum of the University of Pennsylvania.)

Fig. 2. SANDALS OF YUCCA LEAF IN DIAGONAL WEAVING. Toe string, heel string and lacing of the same material and in the same pattern as fig. 1. From a cliff-dwelling of Arizona. Lent by Mr. Stewart Culin.

(Cat. No. 13015, Museum of the University of Pennsylvania.)

Fig. 3. SANDAL OF COARSE YUCCA FIBER IN DIAGONAL WEAVING. Toe string, heel string, and lacing of the same material.

(Cat. No. 45609, U. S. N. M.)

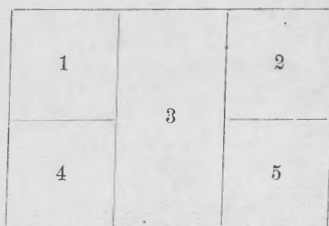
Fig. 4. SANDAL OF SHREDDED YUCCA FIBER. Wicker weaving based on a warp of four ropes, the shredded ends on top; toe string, of double twine; heel string and lacing missing. From a cliff-dwelling of Arizona. Lent by Mr. Stewart Culin.

(Cat. No. 13016, Museum of the University of Pennsylvania.)



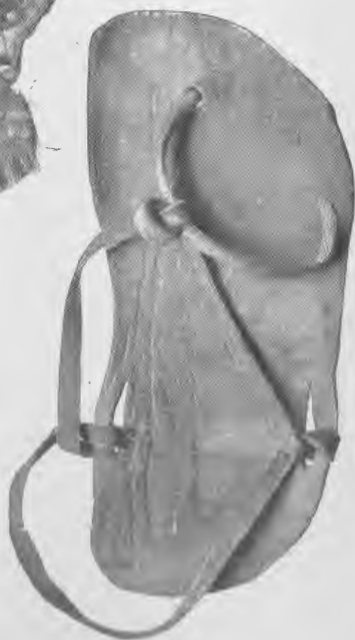
SANDALS WITH STRINGS INCLOSING SECOND AND THIRD TOES.

EXPLANATION OF PLATE 9.



ANCIENT AND MODERN SANDALS FROM MEXICO.

- Fig. 1. SANDAL OF YUCCA FIBER. Checker weaving, double toe string. From Acatita Cave, Coahuila, Mexico. Collected by Edward Palmer.
(Cat. No. 22716, Peabody Museum, Cambridge, Mass.)
- Fig. 2. SANDAL OF SHREDDED YUCCA FIBER. Woven so as to leave a portion of the long pile on top. Perforations for double toe string. From Acatita Cave, Coahuila, Mexico. Collected by Edward Palmer.
(Cat. No. 22718, Peabody Museum, Cambridge, Mass.)
- Fig. 3. SANDAL OF SHREDDED YUCCA FIBER IN TWINED WEAVING. This sandal is made in the shape of the foot and has a double toe string. From Coyote Cave, Coahuila, Mexico. Collected by Edward Palmer.
(Cat. No. 22813, Peabody Museum, Cambridge, Mass.)
- Fig. 4. MODERN SANDAL OF BAST FIBER. Plain weaving, with double toe string crossing over the back of the foot, fastened to the ankle string on either side beneath the ankles and looped over the heel. Worn by the Mohave (Yuman) Indians, Arizona. Collected by Edward Palmer.
(Cat. No. 10119, Peabody Museum, Cambridge, Mass.)
- Fig. 5. TYPICAL LEATHER SANDAL. European pattern, with single toe string. Worn by Indians of Coahuila, Mexico. Collected by Edward Palmer.
(Cat. No. 22863, Peabody Museum, Cambridge, Mass.)



ANCIENT AND MODERN SANDALS FROM MEXICO.

inch to an inch apart. The border is further strengthened by sewing all round with a yarn of yucca fiber. The sandal is nearly worn out, and the toe strings have been set back as though for a smaller foot. Enough of the lacing remains to show that two toe strings passed between 1 and 2 and 3 and 4. (Pl. 9, fig. 3.)

Example No. 10119 of the Peabody Museum is a quadrilateral sandal of the Mohave Indians, Yuman stock, in southwestern Arizona, loaned by Professor Putnam. The sole is a coarse example of checker weaving in strips of cottonwood bark. The warp consists of a series of strips doubled at the toe, so that all ends project at the heel. In finishing off these are turned up and folded on top where they are held in place by whipping. The whole lacing is of one strip of bast, doubled in the middle, which is beneath the sole at the toes. The ends are brought up through two holes in front to inclose toes 1 and 2, and 3 and 4, crossed over the top of the foot, rove through the margin of the sole under the ankle and then twisted onto the other to make a heel band. In older forms farther south the toe-strings do not cross on the top of the foot. (Pl. 9, fig. 4.)

Example No. 22863 in the Peabody Museum is a rawhide sandal from Coahuila, Mexico, consisting of two parts: (1) A simple flat sole with a hole in front for the toe string and two gashes under the ankle for the lacing; (2) the lacing, a strap half an inch wide, knotted underneath the sole, passing up for a toe string over the foot and down to the gash under the outside of the ankle, making a half hitch there, passing around the heel to the gash on the inner side and making a half hitch, and thence up to the instep, where it is tied. Collected by Edward Palmer in 1880. (Pl. 9, fig. 5.)

If the reader will consult the illustrated works of Charnay, Maudslay, Schmidt, and the earlier travelers to Mexico and Central America, he will find that in every case where the artist has not erred, there are two toe-strings or a loop between toes 1 and 2, and 3 and 4. Imagine the knot in the third figure of my plate to be drawn further up toward the instep on the back of the foot, and the thing is done. Mr. Alfred P. Maudslay writes that in all cases the strings pass between toes 1 and 2, and 3 and 4. In the codices, the sandal on the feet of the men is not easily made out. The sole seems to recede and to leave the toes free, but in no case is the single-toe-string visible.

Example No. 41828 (fig. 65) is a shoe worn by the Wolpi Indians of northeast Arizona (Hopi or Moki pueblos). The sole is dish shaped, well turned up around the foot. The upper is sewed to this, and is wrapped around the ankle precisely as in the modern "uppers" or false gaiter tops. This gaiter top is made fast by knots at three separate points, and, in addition, a thong passes about the heel through lugs or loops on the sole just in front of the arch of the foot, and is tied over the instep. At once the similarity will be noted between this example and those from the Navajo encamped in the same region.

Example No. 68657 is a shoe from the Zuñi pueblo, New Mexico, col-

lected by J. W. Powell, Director of the Bureau of Ethnology. It is made from the fronds of the Spanish bayonet (*Yucca elata*) split and woven diagonally. As this form of moccasin is not common in the region and is unique in the national collection, it stands for an innovation by the Zuñi in imitation of modern shoes. Length, $8\frac{1}{2}$ inches; height, 6 inches. A very similar form is example No. 70999, from the Moki or Hopi pueblo in northeastern Arizona. Indeed, these seven towns have preserved to us all the types of basket weaving in the United States.

In seeking to trace the southern limit of the moccasin or shoe, as against a plain sandal, it is well to remember Vaca's saying that the



Fig. 65.

MOCCASIN OF WOLPI PUEBLO INDIANS, ARIZONA.

From a figure in the Second Annual Report of the Bureau of Ethnology.
Cat. No. 41828, U. S. N. M.

Pueblo Indians also wore shoes. He had not mentioned the shoe before and was surprised at their appearance, so it is evident that from Florida to western Texas people went barefooted. The cactus desert may account for the change.¹

The Papago and other Yuman tribes in southwestern Arizona and in northwestern Sonora are sandal wearers now, and their foot-gear is akin to that of the South and of Spain. Example No. 174450 (fig. 66) is one of half a dozen pairs col-

lected by W J McGee, of the Bureau of Ethnology, and may be thus described:

- (1) Soles of cow rawhide, hair beneath, pointing indifferently; rights and lefts, cut around the foot.
- (2) Pierced for toe string and slit in two places below the ankles for the ankle strap, as in a skate.
- (3) Toe string buttoned under the sole by a ratchet produced by leaving a portion of hide to be turned down. The other end of the toe string is slit and provided with loose toggle.
- (4) Ankle strap, a strip of hide with ends passing up through the slits. These are perforated for the fastening of the lashing, which passes over the foot, through this ankle strap, behind the heel, through the other ankle strap and back to the toe string, where it is fastened off. The peculiar button or ratchet beneath the sole, to keep the ankle strap in position, is worthy of a cultured brain.

Examples 19763 and 73001 are sandals of Diegeños and La Costa Indians, California. They are made of *Agave deserti* fiber woven in coarse filaments over a warp consisting of two strands of coarse twine

¹Davis, "Spanish Conquest of New Mexico," p. 101.

of the same material. There are two loops at the heel and one loop at the ball of the foot passing from side to side over the top of the foot. The warp strands are tied together at the toe, drawn up over the foot under the loop back of the heel, then come in front and tie around the ankle. Length, 12 inches. Collected by Edward Palmer.

One type of Mexican sandal sole has five points of attachment for the lacing—one between the toes, one on either side opposite the metatarsals, and one on either side under the heel. The lacing passes around

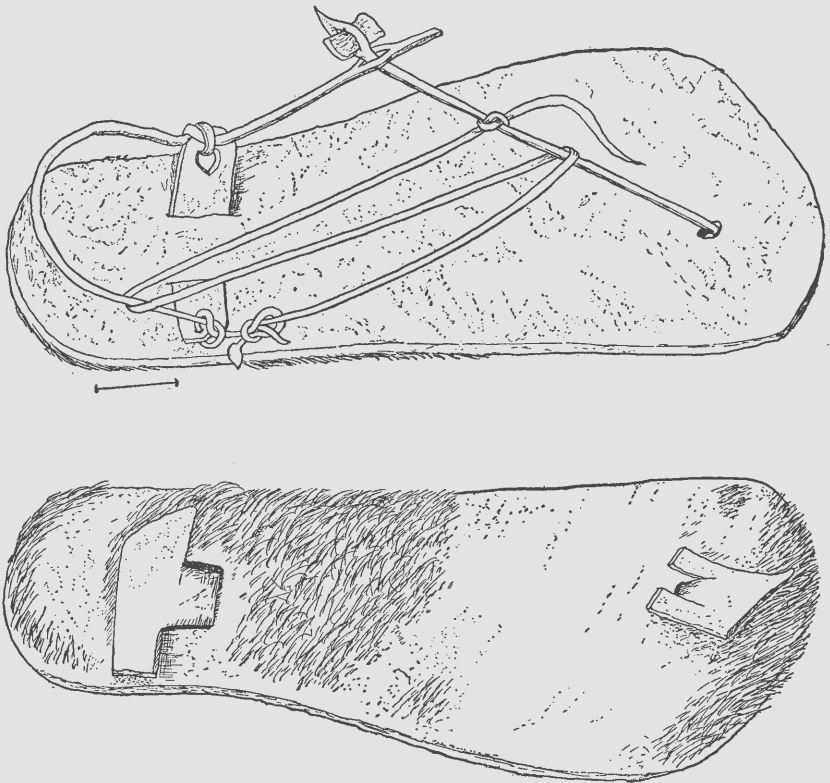


Fig. 66.

RAWHIDE SANDAL OF PAPAGO (PIMAN) INDIANS, SOUTHWESTERN ARIZONA.

Cat. No. 174450, U. S. N. M. Collected by W J McGee.

the heel and below the instep across the front part of the foot, connecting with the five attachments above mentioned. This is very important in the study of the Mexican shoe. In the cliff dwellers and in the Klamath examples the side lacings also appear.

Example No. 17698, in the Peabody Museum, is a pair of sandals from San Luis Potosi, Mexico, consisting of sole and lacing. The former is a strip of harness leather worn smooth side up. They, like most other Mexican specimens, are cut rights and lefts. There are three slashes along either margin, between the ball of the foot and the point beneath

the ankle. The lacing is a strap half an inch wide, looped into the front gash on the inside and passing diagonally to 2 on the outside, to 2 on the inside, to 1 on the outside, to 3 on the inside, and around the heel.

A sandal from Puebla, Mexico, has a sole of rawhide cut to fit the foot roughly, the margins of which are turned up. Along each side six good-sized holes are cut. Beginning at the front left-hand hole a strap one-fourth of an inch wide is woven backward and forward from margin to margin, passing under and over. The last three pairs of holes on each side are devoted to forming a heel by a system of half hitches. Pieces of soft leather slashed and woven onto the lacing protects the back of the foot and the heel. Length, $10\frac{1}{2}$ inches. Collection of Mrs. Fannie B. Ward.

Example No. 152732 is a pair of sandals from Colima, Mexico (fig. 67). These consist of a sole and upper lacing. The sole is a piece of tanned leather, cut somewhat in the shape of the foot. Five holes are pierced

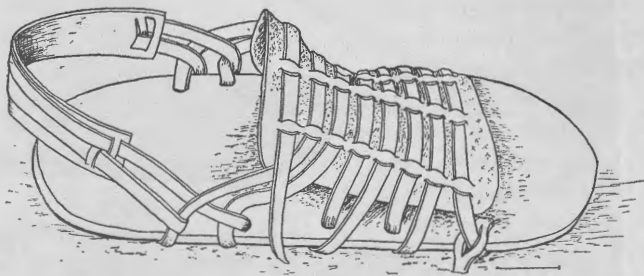


Fig. 67.

MODERN LACED SANDAL OF LEATHER, FROM COLIMA, MEXICO.

Cat. No. 152732, U. S. N. M. Collected by Edward Palmer.

through each side margin of the sole for the lacing. The lacing consists of a continuous leather string one-eighth of an inch wide, which is attached to one side of the sole, and is woven backward and forward through three pairs of holes in the margin of the sole, on the fourth round a half hitch is made and the string carried backward to form the heel, forward by a half hitch through the sole, and then over the foot to the other side, where another half hitch is made, and another string, passed around the sole through a hole in the margin and back again, is fastened off in a pad on the top of the foot. The lacing at each excursion passes through three slits cut in a soft piece of leather, which lies between the foot and the lacing. This shoe should be compared with patterns in South America collected by Mrs. Fannie B. Ward. Length, 9 inches. Collected by Edward Palmer.

Example No. 30382, in the Peabody Museum, Cambridge, is a pair of sandals worn by the Maya of Yucatan, which are rights and lefts; sole double, with extra heel lift beneath; sewed together with single thong; lugs, or loops on the margin under the ankle. The tapering rope lacing

passes up between toes 1 and 2, and then through the loop over the instep and heel as usual. Length, $9\frac{1}{2}$ inches. These are modern and Latin American, doubtless. But Maudslay figures elegantly in *Biologia Central Americana—Archæology*—statues of gods wearing sandals. In the photographs, so far as they can be made out, and in the lithographs, where the artist has followed the original, the double toe strap passes down between toes 1 and 2, 3 and 4, or 1 and 2, 2 and 3.¹

In the American Museum of Natural History are two portions of jars showing the strap between toes 1 and 2, 4 and 5. One from Orizaba (No. 300) has the inclosed heel, shown on the Codices, with separate strings running between the toes to the ankle band. The other example (No. 207), from Guerero, is more complete. The leg is incased like a Zuñi woman's; strings pass from this leg band down between the toes. An examination of any collection of pottery from Middle America reveals the fact at once, if the human foot is portrayed, that the single toe string was not anciently known.²

In one of the sculptured monoliths of Copan, figured by Dr. Julius Schmidt, the feet of the god are incased in sandals very much like those of the Codices, consisting of a sole and the quarters of a shoe without the vamp (fig. 68). In the monolith, however, the thong passes between the first and the second toe.³ In the succeeding monolith⁴ the left toes are broken off, but the right limb presents a square front view. The thong passes between the first and the second and the third and the fourth toe, and is apparently looped or concealed in a ring or horseshoe-shaped object, though this may be only an artist's flourish, the two ends approaching each other, turning outward and terminating in braids in which a loop is caught which descends from a highly ornate rosette in front of the ankle. According to Meye's drawing, the sandal is unfastened by detaching the last-named loops from the braids on the ankle ring. The Eskimo fashion of attaching a similar device is to bring the upper loop under a ring and over a nail head or stud. Mr. Saville confirms these statements from original drawings.



Fig. 68.

FOOT OF STATUE AT QUIRIGUA, GUATEMALA,
SHOWING DOUBLE TOE STRING.

From a figure in Meye and Schmidt's "Stone Sculptures
of Copan and Quirigua."

¹ Cf. Part II, pls. 34, 37, 45, and 46, and Part IV, pls. 77, 79, and 82.

² Cf. Charnay, "Ancients Villes," p. 49, and elsewhere.

³ Meye and Schmidt, "Stone Sculptures of Copan and Quirigua," New York, 1883, Dodd, Mead & Co., pl. III.

⁴ *ibid.*, pl. III.

In pl. IV of Meye and Schmidt's work the feet of the image are turned sidewise, and the sandals exhibit only the heels attached to the soles. The feet of the figure in pl. V are said in the description to be clothed in thick-soled shoes fastened with bows, but the appearance is of a moccasined foot resting on a sandal. The squatting figures in the succeeding plates are barefooted and wear bandages of some kind about the ankle. Pl. XIII (fig. 19 b) shows a masked figure, wearing bands wrapped four times about the lower leg, suggesting the leggings of the pueblo women. In pl. XV, depicting a monolith in Quirigua, the feet are gorgeously covered, either with a shoe consisting of sole, vamp, and decorated quarters, or, in what would be more American, they are clothed in moccasins that rest on a heeled sandal. The thickness of the sole in these figures leaves one puzzled whether this feature is only a sculptor's decoration, but the heel band is still worn in Moki dances.¹

Mr. im Thurn says of the Guiana Indians that they make sandals from the leaf stalk of the æta palm (*Mauritia flexuosa*), to be worn in traveling over stony ground. The string passes between the great toe and the next, and when the sandal is much worn the skin is made callous by the string. In a few hours the sandals are worn out and new ones cut from the nearest æta palm.² Mr. im Thurn also speaks of the neatness with which they fit the foot. This form is of Spanish introduction. Fray Simon, speaking of the Indians encountered on the Orinoco by Aguirre's party, says that they were naked, but had on the soles of their

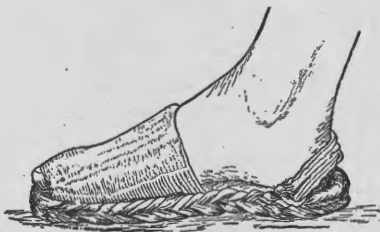


Fig. 69.

PERUVIAN ALPARGATA OR SANDAL WITH BRAIDED SOLE.

From a figure in Whymper's "Great Andes of the Equator."

feet pieces of deerskin, fastened like the sandals worn in Peru or like those seen by him in the provinces of the Government of Venezuela.³

In Whymper's "Great Andes of the Equator," page 143, is a figure of a sandal, with sole of sennit sewed together, and the upper made of woven stuff (fig. 69). There probably would be no doubt in the mind of any student that this foot wear was actually made in Spain. The National Museum possesses a great number of examples of this peculiar type, and the following description of the Spanish example may be compared with the Whymper specimen.⁴

¹Very great caution should be used in the practical interpretation of sculptors' and painters' costume and implements. In Catlin's drawings and paintings of moccasins the very decorative features of the sandals on the statues here referred to are produced, though they have no existence in fact.

²"Indians of British Guiana," London, 1883, p. 195, quoted by Mason, in his work on the "Origins of Invention," Chapter x.

³Bollaert, Publications of the Hakluyt Society, 28, 1861, p. 105.

⁴For the sennit sole, cf. Wiener, "Pérou et Bolivie," p. 680; also Reiss and Stübel, "The Necropolis of Ancon," pl. 88, fig. 4.

The braided-sole sandal of Spain has in it some noteworthy characteristics. The sole nowadays is made of esparto grass, braided, coiled ingeniously to fit the bottom of the foot and sewed through with a stout twine of different material, the stitches being about half an inch apart. The heel and toe are the noteworthy parts. At a cursory glance these, when made of coarse material, resemble in their manipulation the twined weaving of savage and barbarous peoples, but the effect is produced by "darning." For instance, the heel cover is made up by forming a band of warp twines—that is, passing a series of twines backward and forward, catching them under the braided sole as the thrifty housewife proceeds in laying the foundation for darning a stocking. This is done with a long twine, which is afterwards made a quasi weft by sewing it across the band of warp twines, running between the strands of each one, but not in any regular manner. At one excursion this cord extends entirely the length of the foot, pierces the band of cords across the toe, returns through them and then takes up its excursions through the heel band. In an example in the U. S. National Museum the heel is built up of a series of three-ply loosely twisted hemp cord. The embroidery of the weft pierces the warp twines so as always to leave one strand outside the heel and two strands inside, rendering the inside much softer.

There is a low side strip running between heel and toe on the outer upper margin of the sole made up of two or three rows of "button-hole stitches" or "half hitches," each row looped into the one beneath it. It may be a Spanish device, or at least a Latin American device, being found in the netted bags of Latin America everywhere. It also occurs in the fish baskets of Tierra del Fuego. Essentially it is coiled work, only the moving part, instead of running on by a coil, passes under or behind the standing part each time. In no other corner of aboriginal America outside the Latin area has the author seen any such work. The Fuegians, in addition to the endless chainwork of half hitches, use a continuous rod running through the links to give body to the basket. As mentioned elsewhere, a lacework effect is produced by passing the moving part two or more times about the standing part. This is also common from the Southern California Papago through Latin America to Peru.

Reiss and Stübel's gorgeous work on "The Necropolis of Ancon" is poor in figures of foot wear. In Volume I, "Pérou et Bolivie" pl. 25, fig. 26 is the picture of a very interesting sandal of leather. On the margin of the sole on either side a flap is turned up and pierced for the lacing. This specimen should be compared with Assyrian and Somali forms and with the sandal of La Paz, Volume II, pl. 16, fig. 9.

Whymper draws attention to a curious economic distinction in Ecuador, where the carriers "were paid in advance and had to be provided with shoes. Although natives of all sorts were continually met with

trudging barefoot along the roads, whenever one was hired, he found himself unable to walk without shoes."¹

Wiener relates that the Indians who dwell on the high plateaus of South America, obliged to walk at times over the snow, are in the habit, when they skin a llama, to cut out a piece of the green hide, to fit it upon the foot and to keep it bandaged there during twenty-four hours or more to dry into shape and take the form of a low slipper. The wool is left on the outside. Mummies have been found wearing similar foot gear, the foot also enveloped in a sock-like cover. The Indians of the Ceno de Pasco preserve this custom.²

Example No. 127572, from Pachacamac, Peru, is a pair of sandals (fig. 70) from a mummy. These are of a very simple pattern; each one consists of a single piece of rawhide of the llama. When the hide was in a wet or green condition it was stretched over the toe and up about the margin of the foot, slightly rising to a height of 2 inches. Back of

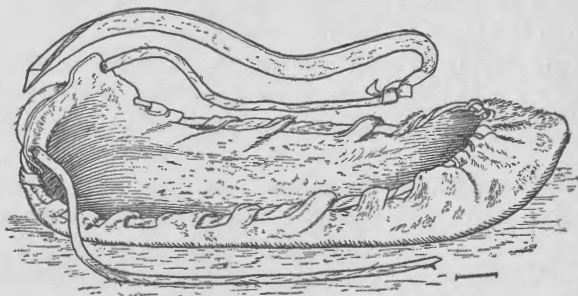


Fig. 70.

RAWHIDE SANDAL WITH PUCKERED MARGIN, FROM PACHACAMAC, PERU.

Cat. No. 127572, U. S. N. M. Collected by William E. Curtis.

the heel a series of slits were then cut all around the upper margin and a drawing string of rawhide passed through all of these slits, beginning at the left side of the heel, passing across to the right side, then around the margin through the holes, back across the heel and through

the left side. The loose ends of this rawhide form the string which passes around the instep, where it is tied or looped. Length, 9½ inches. Collected by W. E. Curtis.

Wiener figures the following foot gear from Peru, partly industrial and partly ornamental (pl. 10):

- (1) Cord, metal ring, broided stuff, about the ankles, said to prevent cramps and accidents.
- (2) Sole, with toe strap, joined with two straps passing in front of instep down to the border of the sole in front of the heel.
- (3) Toe strap, or cord, meeting cord passing around the instep, which is looped onto a heel cord.
- (4) From the border below the instep two loops extend, one about the heel, one over the lower instep.
- (5) Sandal of braided, in Maguey fiber, coiled like a chenille mat.
- (6) Regular sandals and slippers, European models.

¹Whymper, "Great Andes of the Equator," New York, 1892, p. 39.

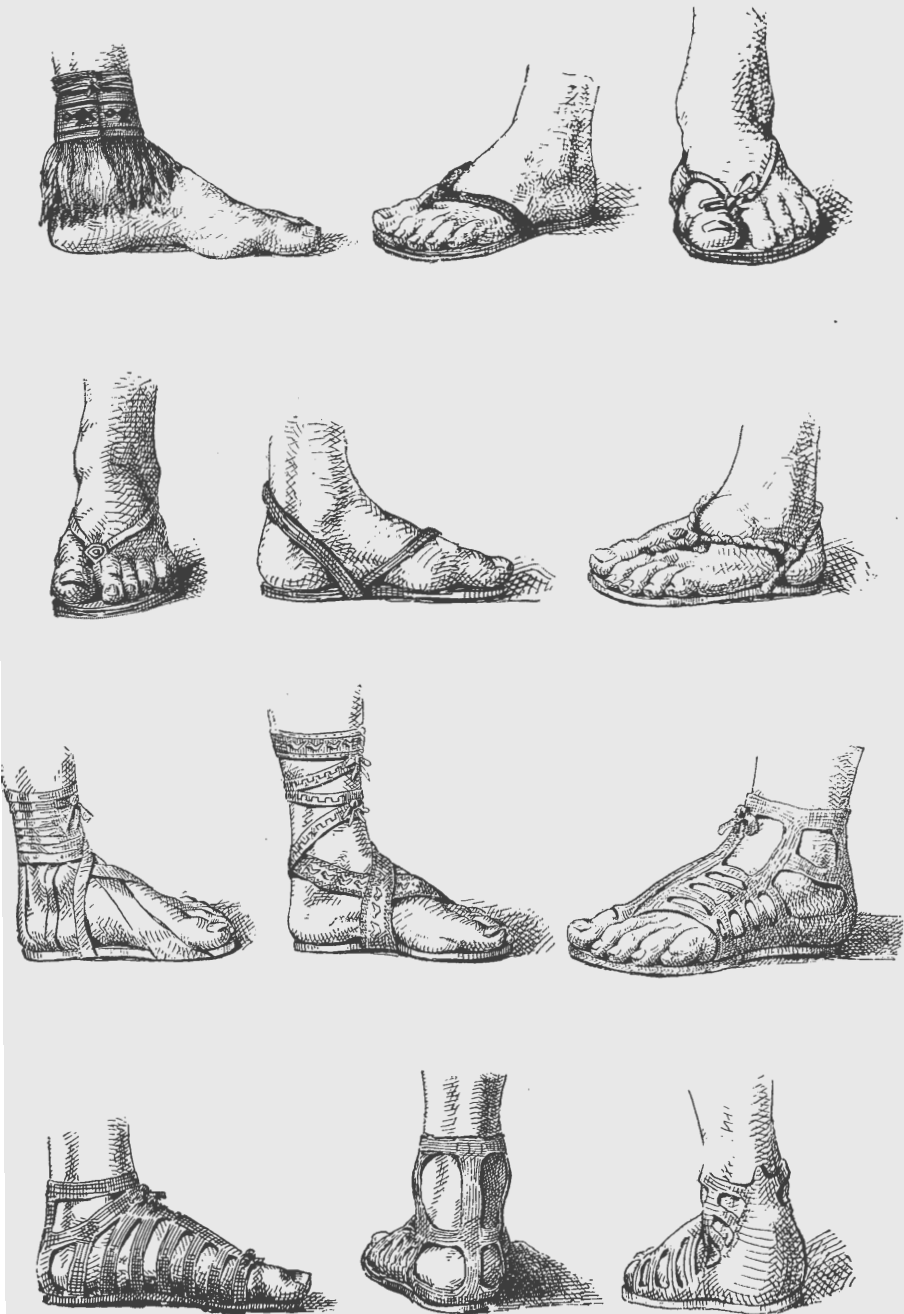
²Wiener, "Pérou et Bolivie." Paris, 1880, p. 679.

EXPLANATION OF PLATE 10.

1	2	3
4	5	6
7	8	9
10	11	12

FOOTWEAR FROM PERU.

- Fig. 1. FRINGED ANKLE BAND, Embroidered material. Ancon.
- Fig. 2. LEATHER SANDAL FROM ARICA, PERU. Single toe strap, bifurcated on the back of the foot and attached to the margin of the sole half way back, as in Japanese specimens.
- Fig. 3. SANDAL OF LEATHER. Found at the foot of the Cerro de la Horca, Paramonga. Single toe string passing through a broad loop in each end of the heel band and fixed at the margin of the sole beneath the ankles.
- Fig. 4. LEATHER SANDAL FROM CHIMBOTE. Single toe strap bifurcated on the back of the foot. Attachments not shown. Rosette at the joining of the straps.
- Fig. 5. LEATHER SANDAL FROM SANTA. Sole held on by two loops fastened under the instep, one passing over the back of the foot, the other behind the heel.
- Fig. 6. SANDAL FOUND IN THE ARENAL OF PARAMONGA. Single toe cord bifurcating an inch or two from the toes and passing to the middle of the heel loop on either side. The extreme variation of this form is in the Mediterranean sandal, in which a band clasps the lower leg, the ankle strings are perpendicular, and the toe string is carried singly across the back of the foot to the leg band.
- Fig. 7. SANDAL FOUND IN THE NECROPOLIS AT GRAN-CHIMU. The especial features are the absence of the toe-string, and the wrapping about the ankles of a series of straps attached to the margin of the sole at various points.
- Fig. 8. ORNAMENTAL SANDAL FOUND AT CHANCAY. This sandal is of little use in travel, but is of the same general style as that shown in fig. 7.
- Fig. 9-12. SANDALS FROM CAJAMARCA, CAJABAMBA, AND VIRACOCOPAMPA. These specimens all have slashed tops.



FOOTWEAR FROM PERU.

From Wiener, "Perou et Bolivie."

In Mrs. Ward's collection from Bolivia is a sandal (figs. 71 and 72) worthy of close study. The leather sole is double, and sewed or "run" together by means of leather thongs after the most approved Moham. median style everywhere seen south and east of the Mediterranean. The toe strap is separate, passing up through the sole, keyed or toggled under the bottom and slit at the upper end for the passage of the thong. A "quarter" or arch strap just beneath the ankles, gashed at each end, passes down through the sole at one margin and rises through the other side. The lacing of hide slit at one end at the toes passes back to the quarter strap, where it takes a half hitch about and through the slit. The lacing thence passes about the heel to the quarter strap on the other side, where it is fastened by another half hitch and thence is continued through the slit in the toe strap and is fastened off in the slit at the beginning.

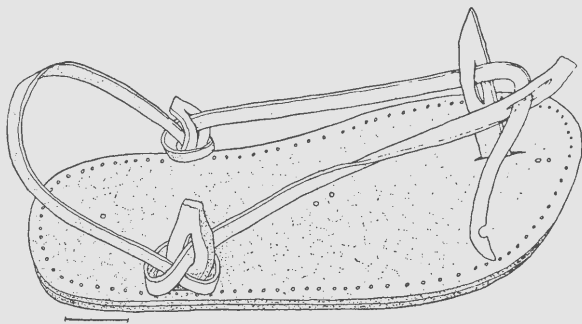


Fig. 71.

MODERN LEATHER SANDAL FROM BOLIVIA.

Collection of Mrs. Fannie B. Ward.

Bandelier sent to the American Museum, New York, four sandals from Arica, Peru, having rawhide soles slashed similarly and provided with looped short straps, gashed at the four ends for receiving the lacing.

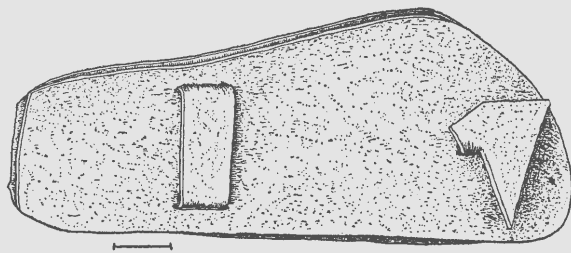


Fig. 72.

BOTTOM OF BOLIVIAN SANDAL, SHOWING ATTACHMENTS.

Collection of Mrs. Fannie B. Ward.

In Mrs. Ward's collection there may be seen another type of sandal from Bolivia (fig. 73) in which there is no strap between the first and the second toe. On the other hand, the quarter or heel strap is repeated underneath the ball of the foot, and its gashed ends come up over the toes as does a skate strap. The lashing is practically the same as in the last example.

The Patagonians (Tehuelche stock) wear potro boots made of the skin stripped from the knee and hock of a horse or large puma not unlike the bottes sauvages of Canada mentioned on page 345; over these they

sometimes wear overshoes made of the skin from the hock of the guanaco. The footmarks made by them when thus shod would be abnormally large, which gave rise to the name Patagon, or big foot.

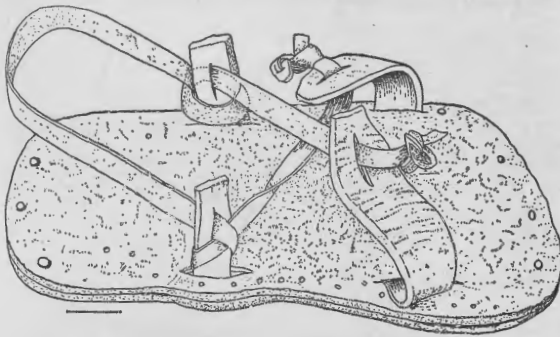


Fig. 73.

BOLIVIAN LEATHER SANDAL, WITHOUT TOE-STRAP.

Collection of Mrs. Fannie B. Ward.

similar material, namely, thick uncolored hide, is in general use among the Canadian and New England lumbermen. The history of Portuguese foot clothing is not well enough known to enable the student to decide whether this style was adopted from the American moccasin. The road would be a round-about one, since the Portuguese in America were very far away from the northern moccasin made all in one piece.

Example No. 128069 (fig. 74) is a wooden

shoe from Minnesota (called sabot). It is made from poplar wood and is a typical example of the wooden shoe of northern and western Europe, especially in the Netherlands and Scandinavian countries. This example

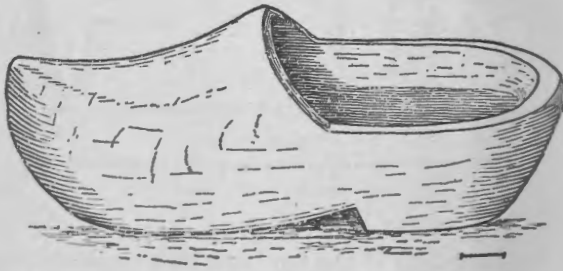


Fig. 74.

SABOT OR WOODEN SHOE, FROM MINNESOTA.

Cat. No. 128069, U. S. N. M. Collected by Reuben Wright.

Example No. 55860 is a pair of man's shoes from Portugal. Uppers and soles are in one piece finished at the top with a softer leather; the upper border in front is puckered. The top is sewed together at the heel in a T-shaped seam, but the extra piece of leather is turned up inside. This shoe must be compared with the Eskimo shoes for the puckering, and with those of the interior Indians for the manner of joining the edges at the heel. The same style of foot wear made of very

was made and worn in Minnesota by a Dane. Excellent wood for these shoes is found throughout the Mississippi Valley from the Gulf northward, and factories have been established for their manufacture, whence they are shipped to supply the European market. Length, 13 inches. Collected by Reuben Wright. The sabot in modern Europe has two or three motives of geographic expansion. In the Netherlands it lifts the foot above the wet ground. It is found in the countries where extremely light wood abounds. It is durable, and above all, in modern economies it is cheap, a man being able to shoe his whole family a year for what it costs for a single pair of leather foot wear in one of our cosmopolitan cities. The antiquity of the sabot is difficult to trace.

SANDALS, SHOES, AND BOOTS IN THE U. S. NATIONAL MUSEUM.

Museum number.	Specimen.	Locality.	By whom contributed.
75051	Sandals, clogs with toe bands	England	New Orleans Exposition.
75052, 75053	Shoes, wooden	do	Do.
126956	Clogs, shoes for laborers	do	Do.
126957	Shoes	do	Do.
126958	Hobnail shoes	do	Do.
150876	Wooden clogs	do	Edward Lovett.
175473	Rude hide sandals	Shetland Islands	Do.
76381	Shoes, lauparsko	Norway	Otis Bigelow.
13144	Wooden shoes, Danish	Greenland	Frank Y. Commagére.
76635	Shoes, wooden, Swedish (fig. 74)	Michigan	R. E. Earll.
128069	Wooden shoes, Swedish	Minnesota	Reuben Wright.
75055	do	Belgium	
75056-75059	Shoes	do	
76491	Shoes, carved, wooden	do	Max Potachak.
76492, 76493	do	do	Do.
129417	Shoes, wooden	Holland	Mrs. E. S. Brinton.
151282	Wooden clogs	Switzerland	W. W. Rockhill.
55859, 55860	Leather moccasins (p. 371)	Portugal	Centennial Commission.
55857	Leather leggings	do	Do.
73124	Sandals, Alpargatas	Spain	Do.
167007	Child's sandals	Madrid, Spain	Walter Hough.
167008	Man's sandals	do	Do.
129414	Child's rag shoes	Northern Italy	Mrs. E. S. Brinton.
129418	Slippers	Germany and Italy	Do.
129416	Red shoes, Turkish pattern	Athens, Greece	Do.
129415	Wooden sandals	Island of Rhodes	Do.
168609-168611	Shoes, thick soled	Bulgaria	Sophia Museum.
126937	Slippers, felt and fur lined	Russia	State Department.
126940	Lady's felt boots	do	Do.
126941	Men's felt boots	do	Do.
126942	Lady's kid shoes, buttoned	do	Do.
126944	Child's cloth shoes	do	Do.
126945	Lady's half slippers	do	Do.
43073	Sandals, Afghan type (p. 318)	Monrovia, Africa	Hon. J. H. Smyth.
168052	Stilted clogs, toe string	Mandingo, Africa	J. F. Cook.
168876	Sandals, Mandingo	Angola, Africa	Colonization Society.
174689	Boots, red legs	Kongo, Africa	Dorsey Mohun.
174767	Wooden sandals with toe pegs	do	Do.
151741	Slippers, Portuguese	Angola, Africa	Heli Chatelain.

SANDALS, SHOES, AND BOOTS IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
151146	Child's sandals (p. 329).....	Korea.....	W. W. Rockhill.
167706	Shoes, man's.....	do.....	H. B. Hurlbert.
167707	Shoes, woman's.....	do.....	Do.
167708	Shoes, child's.....	do.....	Do.
167709	Sandals, child's.....	do.....	Do.
167710	Clogs, child's.....	do.....	Do.
73107	Antelope-skin shoes.....	Japan.....	P. L. Jouy.
73986	Shoes.....	do.....	Col. Alex. Johnston.
116211	Straw sandals (fig. 43).....	do.....	Bureau of Ethnology.
128161-128173	Last and straw sandals.....	Tokio and Yokohama.....	Japanese Government.
150487	Straw sandals.....	Japan.....	Romyn Hitchcock.
150637	Fishskin shoes, with snowshoes (p. 333).	do.....	Do.
150644	Sandals (p. 333).....	Yezo, Japan.....	Do.
5797	Gaiters.....	Japan.....	Perry expedition.
22192	Sandals (fig. 36).....	Ainos, Japan.....	Benjamin S. Lyman.
73082	Snowshoes, hunter's.....	Tate Yama, Japan.....	P. L. Jouy.
73084, 73085	Sandals.....	Nikko, Japan.....	Do.
73091	Boots straw (fig. 44).....	Tate Yama, Japan.....	Do.
73092	Straw boots, hunter's.....	do.....	Do.
167961	Moccasins, woman's, birch bark (figs. 45, 47).	Finland.....	Hon. J. M. Crawford.
167968, 167969	Shoes.....	do.....	Do.
167970	Shoes, child's.....	do.....	Do.
167976	Slippers, woman's.....	do.....	Do.
73026	Long boots, tarbossas.....	Kamchatka.....	Leonhard Stejneger.
153524	Boots.....	Siberia.....	Lient. G. B. Harber, U. S. N.
2438	Boots, Alaskan type.....	Chukchi.....	Commodore Rodgers.
2440, 2441	Water-proof boots.....	do.....	Do.
73025	Dressed-skin boots, soles of sea- lion flippers.	Bering Island.....	Leonhard Stejneger.
44686	Summer boots, many insertions....	Cape Nome, Alaska.....	E. W. Nelson.
49167	Waterproof boots, winter.....	Diomed Island, Alaska.....	Do.
44347	Toy sealskin boots.....	Norton Bay, Alaska.....	Do.
43344	Boottees, waterproof.....	Golovina Bay, Alaska.....	Do.
43345	Boots, sealskin (p. 340).....	do.....	Do.
7581	Boots, deerskin, winter.....	Unalakleet, Alaska.....	W. H. Dall.
17591	Boottees, sealskin (pl. 4).....	Norton Bay.....	Do.
36194	Boots, dressed sealskin.....	do.....	E. W. Nelson.
38771	Boots, waterproof (p. 341).....	do.....	Do.
49063	Man's fancy boots.....	do.....	Do.
76338	Fishskin boots.....	Norton Sound, Alaska.....	Do.
7583	Riding boots, dogskin.....	St. Michaels, Alaska.....	W. H. Dall.
38703	Grass shoes.....	do.....	E. W. Nelson.
129344	Shoes, high, elegant.....	do.....	L. M. Turner.
129821	Woman's boots.....	do.....	General Hazen.
129822	Boots, skin.....	do.....	Do.
38697-38699	Boots, toy.....	Fort Yukon, Alaska.....	E. W. Nelson.
38700	Shoes, toy.....	do.....	Do.
38370	Boots, fishskin.....	Lower Yukon, Alaska.....	Do.
153737	Half boots, woman's.....	Yukon, Alaska.....	J. H. Turner.
8784	Straw shoes, Eskimo.....	Premoraka.....	W. H. Dall.
38794	Boots, fishskin.....	Anvik, Alaska.....	E. W. Nelson.
43903-43906	Boots, salmon skin.....	do.....	Do.

SANDALS, SHOES, AND BOOTS IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
48130, 48131	Boots, fishskin	Anvik, Alaska.....	E. W. Nelson.
5594, 5595	Boots, child's.....	Yukon River, Alaska...	W. H. Dall.
5591	Boots, salmon skin	do	Do.
10486	Boots, sealskin (pl. 4).....	do	J. T. Dyar.
10487	do	do	Do.
11440	Boots, skin	do	W. H. Dall.
36206	Shoes, child's, fine	Alaska	E. W. Nelson.
153735	Boots, waterproof	Yukon, Alaska	J. H. Turner.
153736	Boots, half	do	Do.
16339	Boots, sealskin	Nunivak, Alaska	W. H. Dall.
38779	Boots, deerskin, soles flat.....	Kuskokwim, Alaska....	E. W. Nelson.
7954	Boots, reindeer skin	Nushagag, Alaska.....	Dr. T. T. Miner.
38871	Boots, winter, deerskin.....	do	E. W. Nelson.
43280, 43281	Boots, tarbossas	do	Do.
20921	Boots, winter, decorated	Aleutian Islands	J. G. Swan.
48102	Boots, waterproof	Unalaska, Alaska.....	E. W. Nelson.
168295	Shoes, grass (fig. 44).....	Attu, Alaska	Lieut. G. T. Emmons.
127332	do	Togiakumut, Alaska ..	J. Applegate.
90460	Moccasins, fishskin	Igiagik River.....	William J. Fisher.
55971	Boots, waterproof, fishskin.....	Bristol Bay, Alaska....	Charles L. McKay.
56061	Boots, men's.....	do	Do.
72503, 72504	Moccasins, women's.....	Kenai Indians	William J. Fisher.
49164	Boots, deerskin	Kotzebue Sound	E. W. Nelson.
129661, 129662	Boots, sealskin bottoms.....	do	Lieut. G. M. Stoney.
127950	Boots	Putnam River, Alaska..	Do.
56749, 56750	Boots, men's (figs. 49, 52).....	Point Barrow, Alaska ..	Lieut. P. H. Ray.
74042	Woman's pantaloons (fig. 48).....	do	Do.
76182	Boots, woman's waterproof (fig. 53).	do	Do.
89834	Boots, skin of mountain sheep (fig. 51).	do	Do.
128409	Boots, man's winter	do	E. P. Herendeen.
153892	Boots, reindeer (p. 338).....	do	John Murdoch.
912, 915	do	Anderson River.....	Robert MacFarlane.
916	Boots, muskrat skin	do	Do.
1332	Boots, sealskin, waterproof (pl. 4).....	do	C. P. Gaudet.
1333	Boots, deerskin	do	Do.
1669	Boots, fox skin	do	Robert MacFarlane.
1683	Boots, deerskin	do	Do.
1692	do	do	Do.
1718	Boots, sealskin	do	Do.
2056	Shoes, child's	do	Do.
2059	Boots, Eskimo, man's	do	Do.
2060	Shoes, man's (pl. 4)	do	Do.
2061	Shoes, child's	do	Do.
2219	Boots, Eskimo	do	Do.
2220	Boots, without tops	do	Do.
2222, 2223	Shoes, child's	do	Do.
2226	Shoes, woman's	do	Do.
2227	Overshoes, fur	do	Do.
3979	Boots, woman's winter (pl. 4)	do	Do.
3980	Boots, man's winter (pl. 4, fig. 6)	do	Do.
3981	Overshoes, Eskimo (pl. 4).....	do	Do.
3982	Boots, man's	do	Do.
3983	Boots, man's summer (pl. 4)	do	Do.

SANDALS, SHOES, AND BOOTS IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
3985	Soles, man's sealskin boots	Anderson River	Robert MacFarlane.
7723-7725	Boots, deerskin	do	Do.
7648	Boots, part of deerskin	do	Do.
2053	do	do	Do.
3977	Shoes, child's	do	R. Kennicott.
864	Boots, Eskimo	Mackenzie River	Do.
865	Boots, Eskimo	do	Do.
1717	Boots, men's deerskin	do	Robert MacFarlane.
1720	Shoes, child's	do	Do.
1721-1723	Boots, men's deerskin, sealskin, and fox skin.	do	Do.
127951	Boots, man's	do	Do.
10189	Models of Eskimo shoes	Repulse Bay	Capt. C. F. Hall.
10379	Boots, sealskin, waterproof	Hecla Strait	Do.
68115	Boots, sealskin, fur	Hudson Bay	J. Temple Brown.
68116	do	do	Do.
68117	Overshoes, sealskin	do	Do.
68121	Boots, woman's, deerskin, fur inside	do	Do.
68122-68124	Boots, waterproof	do	Do.
68142	Shoes, child's, waterproof	do	Do.
553, 554	Boots	Upernavik, Greenland ..	Dr. I. I. Hayes.
558, 559	Boots, long, double	do	Do.
567	Boots, man's	do	Do.
13133-13138, 13152	Boots, sealskin	Greenland	F. Y. Commagére.
36966	Boots, fur lined	do	Governor Fenckner.
36967	Shoes	do	Do.
127137	Boots, long, ornamented	South Greenland	Mrs. Octave Pavy.
127138	Slippers, sealskin	do	Do.
151668	Boots (four pairs)	Greenland	Dr. C. H. Merriam.
151665	Boots, sealskin, double	do	Dr. F. M. Hoadley.
168921, 168922	Boots, man's	East Greenland	Royal Museum of North- ern Antiquities, Copen- hagen, Denmark.
168933, 168934	Boots, woman's	do	Do.
74487	Gaiter shoes	Ungava, Labrador	L. M. Turner.
90062, 90063	Moccasins, Tinné type	do	Do.
90066-90070	Shoes, child's, T-shaped toes (p. 348)	do	Do.
90076-90081	do	do	Do.
90189-90193	Shoes, corrugated soles	do	Do.
90356, 90357	Shoes, child's, winter (p. 343)	do	Do.
90358-90365	Boots, type set, models (p. 342)	do	Do.
90366	Boots, toy, hair inside	do	Do.
150890	Shoes, child's, waterproof	do	Miss Anna L. Ward.
151667	Boots, outside	do	Dr. C. H. Merriam.
153507	Moccasins	do	Henry G. Bryant.
153516	Boots	do	Do.
74435	Moccasins, Tlingit Indian	Southeastern Alaska	J. J. McLean.
129354	do	Interior Alaska	L. M. Turner.
153865	Moccasins, child's	do	J. H. Turner.
839	Moccasins, man's	Fort Good Hope	R. Kennicott.
840, 841	Shoes, man's	do	Do.
5651	Moccasins	do	Do.
577	Shoes, porcupine quill work	Fort Simpson, Canada ..	B. R. Ross.

SANDALS, SHOES, AND BOOTS IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
578	Shoes, ornamental.....	Fort Simpson, Canada..	B. R. Ross.
1336	Moccasins (p. 346).....	Anderson River	C. P. Gaudet.
2221	Moccasins, child's	do	R. MacFarlane.
7612	Moccasins	Yukon River	W. H. Dall.
7613-7615	Moccasins (p. 346).....	do	Do.
166962-166965	Moccasins (p. 347).....	do	J. H. Turner.
11390	Moccasins, child's.....	Southeast Alaska.....	Vincent Colyer.
20920	Boots, Indian	do	Jas. G. Swan.
21580	Moccasins	do	Dr. J. B. White.
2018, 2043	Moccasins, Chippewayan	Fort Simpson, Canada..	B. R. Ross.
8694	Moccasins	Fort Good Hope	R. Kennicott.
131095	Moccasins, bear's feet.....	Fort St. James, Canada.	R. MacFarlane.
674	Moccasins, Blackfoot	Saskatchewan	Geo. Gibbs.
30842	Moccasins, low, with lapels	Cognowaga, Canada....	Dr. G. Brown Goode.
76562-76565	Boots and shoes.....	Canada	State Department.
151388	Moccasins, Oneidas.....	New York	Mrs. E. J. Stone.
74201	Moccasins, Iroquois.....	North Carolina	F. H. Cushing.
130478	Moccasins, Cherokee.....	do	Bureau of Ethnology.
153506	Moccasins, Montagnais	Labrador	Henry G. Bryant.
30837	Moccasins, Micmac	Shubeuacadie, Nova Scotia.	Dr. G. Brown Goode.
30838	do	do	Do.
30839	Moccasins, heavy bead work	do	Do.
30840, 30841	Moccasins, bead and porcupinework	do	Do.
8544	Moccasins, Arapahoe	Nebraska	Medical Museum, U.S.A.
151934	do	do	Capt. J. G. Bourke, U.S.A.
153052	do	Oklahoma	Emile Granier.
165140	do	Wyoming	Bureau of Ethnology.
165786	do	Indian Territory	H. R. Voth collection.
165804-165811	Moccasins, Arapahoe (p. 350)	do	Do.
6988	Moccasins, Cheyenne	do	E. Palmer.
8350	do	do	Medical Museum, U.S.A.
130797	do	do	Mrs. J. G. Bruff.
165914	Moccasins, girl's.....	Indian Territory	H. R. Voth collection.
165981, 165982	Moccasins, woman's	do	Do.
165983, 165984	Moccasins, man's	do	Do.
165985	Moccasins, woman's	do	Do.
165986-165989	Moccasins, man's	do	Do.
165990-165992	Moccasins, woman's	do	Do.
165993-165998	Moccasins, child's.....	do	Do.
166008	Moccasins, toy	do	Do.
166009	Moccasins and leggings, woman's.....	do	Do.
10110	Moccasins, Ponca Indians.....	Fort Randall	Asst. Surg. A. J. Comfort, U. S. A.
151991	do	do	Capt. J. G. Bourke, U.S.A.
7090	Moccasins, Ogallala Sioux	do	Lieutenant Belden, U. S. A.
165022-165026	do	do	Bureau of Ethnology.
154319	Moccasins, child's.....	Leech Lake, Minn	Dr. W. J. Hoffman.
8869	Moccasins	Kansas	Medical Museum, U.S.A.
154354	Moccasins, Crow	Montana.....	Dr. W. J. Hoffman.
154355	Moccasins, man's, beaded	do	Do.
30260	Moccasins, beaded, Sioux.....	Missouri.....	Dr. R. Mueller.
1897	Moccasins, Sioux	do	Lieut. G. K. Warren.

SANDALS, SHOES, AND BOOTS IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
1898-1901	Moccasins, Sioux	Missouri.....	Lieut. J. K. Warren.
1902	Moccasins, child's, Sioux.....	do	Do.
8364	Moccasins, Sioux	Red River	Robert E. Williams.
164820	do	Pine Ridge Agency.....	Mrs. E. C. Sickels.
21670	do	do	Dr. J. F. Boughter, U.S.A.
166688	do	Arizona	James Mooney.
166689	Moccasins, child's, Sioux.....	do	Do.
152855	Moccasins, Kiowa (p. 350).....	Indian Territory.....	Do.
152926	Moccasins, toy, Kiowa	do	Do.
152967	Moccasins, Kiowa.....	do	Do.
152968	Moccasins, boys, Kiowa	do	Do.
153567	Moccasins, child's, Kiowa	do	Capt. R. H. Pratt, U.S.A.
153568	Moccasins, man's, Kiowa	do	Do.
165238	Moccasins, man's, Kiowa, type	do	James Mooney.
23740	Moccasins, Sioux.....	Devils Lake, Dakota.....	Paul Beckwith.
31037	Moccasins, beaded, Dakota.....	do	War Department.
31038	Moccasins, child's, Sioux.....	do	Do.
130799	Moccasins, Sioux.....	do	Mrs. J. G. Bruff.
131353	do	do	Mrs. A. C. Jackson.
151387	Moccasins, child's, Dakota.....	do	Mrs. E. J. Stone.
153569	Moccasins, men's, Sioux.....	do	Capt. R. H. Pratt, U.S.A.
153991	do	do	Mrs. M. M. Hazen.
153992	Shoes, Sioux	do	Do.
154356	Moccasins, beaded, boy's	Montana.....	Dr. W. J. Hoffman.
154363	Moccasins and leggings, child's	Crow Agency.....	Do.
2107	Moccasins, Omaha Indians	Omaha.....	Rev. Wm. Hamilton.
127619	do	Nebraska.....	Mrs. J. O. Dorsey.
165024	Moccasins, Assiniboine Indians.....	do	Lieut. Cook, U. S. A.
8348	Moccasins, Sioux.....	do	Medical Museum, U.S.A.
8362	Moccasins, Dakota.....	do	Do.
8505	Moccasins, Sioux.....	Dakota	Do.
13143	Moccasins.....	do	Dr. E. Coues.
153993	Moccasins, child's, Sioux.....	do	Mrs. M. M. Hazen.
153994	Moccasins, unfinished, Sioux.....	do	Do.
164819	Moccasins, Sioux.....	do	Miss E. C. Sickles.
165145	do	South Dakota.....	James Mooney.
165146	do	do	Do.
169042	Moccasins, boy's	do	Dr. Z. T. Daniels.
8535	Moccasins, Sioux (p. 350)	Nebraska.....	Medical Museum, U.S.A.
165023	Moccasins, Brulé.....	Dakota	Lieut. Cook, U. S. A.
165025	do	do	Do.
165239	Moccasins, Kiowa.....	Indian Territory	James Mooney.
1466	Moccasins.....	Texas and Mexico	Lieut. Couch, U. S. N.
1471	Moccasins, Comanche	do	Do.
6983	Moccasins and leggings, Comanche.....	do	E. Palmer.
6984, 6985	Moccasins, Comanche	do	Do.
130798	do	New Mexico	Mrs. J. G. Bruff.
152816	do	Indian Territory	James Mooney.
131261	Moccasins.....	Texas	Minor Kellogg.
131262	Moccasins, child's.....	do	Do.
9095	Moccasins, Pawnee.....	Nebraska.....	L. W. Platt.
6986, 6987	Moccasins, Caddo (p. 351).....	do	E. Palmer.
6989	Moccasins, Wichita.....	do	Do.
76785, 76786	Moccasins, Chetemacha, type.....	Louisiana.....	C. E. Whitney.

SANDALS, SHOES, AND BOOTS IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
56748	Woman's pantaloons, buckskin . . .	Kenai Indians	Wm. J. Fisher.
7955	Boots, reindeer skin	Chilcat, Alaska	Dr. T. T. Minor.
11386	Moccasins	Wrangell, Alaska	Vincent Colyer.
20815-20817	Moccasins, Stikine Indians . . . . .	. . . do	J. G. Swan.
20795, 20796	Moccasins	Sitka, Alaska	Do.
20797	Moccasins (p. 351) . . . . .	. . . do	Do.
2129	Boots, child's	Northwestern coast of America	Commodore Wilkes, U. S. N.
2131	Shoes, grass . . . . .	. . . do	Do.
9059	Moccasins	Fort Colville, Wash	Dr. James T. Ghiseln.
673	Moccasins, Chinook (p. 352)	Columbia River	George Gibbs.
24073-24078	Moccasins, Klamath	Oregon	L. S. Dyar.
24079, 24080	Shoes for winter, Klamath . . . . .	. . . do	Do.
23855	Moccasins, Nez Percé (p. 352)	Idaho	J. B. Monteith.
167726, 167727	Moccasins, child's, Bannock . . . . .	. . . do	Ed. Palmer.
131243	. . . do . . . . .	. . . do	Dr. George M. Kober.
151715	. . . do . . . . .	. . . do	Prof. C. H. Hitchcock.
165147	Moccasins, Shoshone	Wyoming	James Mooney.
22011	Moccasins	Northern Wyoming	Maj. J. W. Powell.
22018	. . . do . . . . .	. . . do	Do.
22020	. . . do . . . . .	. . . do	Do.
1197, 1198	Moccasins, plain . . . . .	. . . do	Do.
12066, 12067	Moccasins, Pai-Utes	Southern Utah	Do.
12068, 12069	Moccasins, womens' Pai-Utes . . . . .	. . . do	Do.
14384-14391	Moccasins, Pai-Utes . . . . .	. . . do	Do.
17217, 17218	Moccasins	Utah	Do.
19831	. . . do . . . . .	. . . do	Do.
19836	. . . do . . . . .	. . . do	Do.
19841	. . . do . . . . .	. . . do	Do.
165148	Moccasins, Shoshone	Wyoming	James Mooney.
19628	Moccasins, child's	Walker Lake, Colo.	S. Powers.
21347	Moccasins, Hupa Indians	California	Do.
21721	Moccasins, McCloud River Indians . . . . .	. . . do	Livingston Stone.
21722, 21723	. . . do . . . . .	. . . do	Do.
10778	Moccasins, Ute Indians	Colorado	Maj. J. W. Powell.
10779	Moccasins, beaded, Ute Indians . . . . .	. . . do	Do.
10780	Moccasins, with long leggings . . . . .	. . . do	Do.
10788, 10789	Moccasins, Ute Indians . . . . .	. . . do	Do.
11195, 11196	Moccasins, Moki	Arizona	Do.
11198, 11194	Boots, hide soles . . . . .	. . . do	Do.
45607	Sandals, straw	Silver City, N. Mex	Henry H. Rusby.
45609	Sandals, large (a fragment) (pl. 71) . . . . .	. . . do	Do.
45610	Sandals, child's (pl. 7) . . . . .	. . . do	Do.
20929	Sandals, yucca fiber (p. 357)	St. George, Utah	E. Palmer.
5555	Boots, Apache	Arizona	Do.
5556	Boots, Tonto Apache . . . . .	. . . do	Do.
7314	Moccasins and leggings, Apache . . . . .	. . . do	Maj. W. H. Mills.
11321	Boots, long, Apache . . . . .	. . . do	W. F. M. Army.
21533-21535	Moccasins, with legs, Apache	Arizona	Dr. J. B. White, U. S. A.
27824	Moccasins, girls', Shoshone	Utah	Maj. J. W. Powell.
115380-115383	Moccasins, Gosh Utes . . . . .	. . . do	Do.
115383-115385	Moccasins, child's . . . . .	. . . do	Do.
151443	Moccasins, used in Mormon church . . . . .	. . . do	George Woltz.
152569	Moccasins, Utes . . . . .	. . . do	Lewis Engel.

SANDALS, SHOES, AND BOOTS IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
73001	Shoes, mescal fiber, La Costa Indians.	Lower California	H. C. and Chas. R. Orcutt.
19848	Moccasins	Utah	Maj. J. W. Powell.
19856	.....do.....	.....do.....	Do.
19859	.....do.....	.....do.....	Do.
19863	.....do.....	.....do.....	Do.
19866	.....do.....	.....do.....	Do.
19871	.....do.....	.....do.....	Do.
22001	Moccasins and leggings, woman's.	Northern Utah.....	Do.
27820	Moccasins, boy's, Shoshone.....	Utah.....	Do.
68657	Overshoes, basket, Zuñi (p. 361) ...	New Mexico.....	Do.
127702	Moccasins, Zuñi .....	.....do.....	Bureau of Ethnology.
166619	Moccasins, Hopi Indians.....	Arizona.....	James Mooney.
166638	.....do.....	.....do.....	Do.
166789	Moccasins and leggings, Hopi Indians.	.....do.....	Do.
166791	.....do.....	.....do.....	Do.
166793	Moccasin straps, Hopi Indians.....	.....do.....	Do.
166805	Moccasins, red tops, Hopi Indians.....	.....do.....	Do.
22818	Moccasins	Tusayan, Ariz.....	Maj. J. W. Powell.
22830, 22831	Moccasins, boy's, Moki .....	.....do.....	Do.
22903	Moccasins, winter, Moki .....	.....do.....	Do.
23156	Moccasins, Moki .....	.....do.....	Do.
41723	Moccasins, woman's, Moki .....	.....do.....	Col. J. S. Stevenson.
41828	Moccasins, man's, Moki (fig. 65).....	.....do.....	Do.
41829-41832	Moccasins, child's, Moki .....	.....do.....	Do.
68969	.....do.....	.....do.....	Do.
68970-68974	.....do.....	.....do.....	Do.
68976-68978	.....do.....	.....do.....	Do.
84283	Shoes, child's, Moki .....	.....do.....	V. Mindeleff.
166682	Moccasins, child's, Moki.....	.....do.....	James Mooney.
166685	.....do.....	.....do.....	Do.
166687	Moccasins, child's, Moki .....	.....do.....	Do.
11790, 11791	Moccasins, Oraibi .....	.....do.....	Maj. J. W. Powell.
128957	Shoes, woman's, Oraibi .....	.....do.....	Mrs. M. E. Stevenson.
1057	Sandals, Indian	Casa Grande, Gila River.	Col. Paston.
9364	Last for moccasins	Arizona	E. Palmer.
174450	Sandals, rawhide (fig. 66)	Sonora, Mex	W J McGee.
166596	Moccasins and leggings, Navajo.....	Arizona.....	James Mooney.
166597	Moccasins, driller's, Navajo.....	.....do.....	Do.
166621	Moccasins, black, silver button, Navajo.	.....do.....	Do.
17349	Moccasins	New Mexico	G. M. Wheeler.
76896	Sandals, plaited	Huaguechila.....	Mexican Commission
130711	Moccasins, child's	Pueblo.....	Rev. Father Walter.
17346	Moccasins, Zuñi	New Mexico	G. M. Wheeler.
21540	Sandals, hide, Zuñi	Arizona	Dr. J. B. White, U. S. A.
21541, 21542	.....do.....	.....do.....	Do.
24215	Sandals, willow bark, Mohave	Colorado River	E. Palmer.
24222	.....do.....	.....do.....	Do.
8357	Moccasins	New Mexico.....	Medical Museum, U. S. A.
9979	Shoes and leggings, woman's .....	.....do.....	E. Palmer.
17350	Moccasins, child's.....	.....do.....	G. M. Wheeler.
47177	Shoe	Santa Domingo, N. Mex.	Maj. J. W. Powell.

SANDALS, SHOES, AND BOOTS IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
153169	Soles of sandals.....	Rio Grande, Mexico.....	Capt. J. G. Bourke, U. S. A.
152732	Sandals (fig. 67).....	Colima, Mexico.....	E. Palmer.
174484	Sandals, rawhide.....	Sonora, Mexico.....	W J McGee.
31039	Moccasins, Apache.....	Yuma, Ariz.....	Maj. W. H. Brown, U. S. A.
152519	.....do.....	.....do.....	Capt. J. G. Bourke, U. S. A.
153566	Moccasins, woman's, Apache.....	.....do.....	Capt. R. H. Pratt, U. S. A.
8356	Moccasins, Navajo Indians.....	New Mexico.....	Asst. Surg. John Brooke.
9549, 9550	Moccasins, Navajo Indians (figs. 63 and 64).	.....do.....	E. Palmer.
16503	.....do.....	.....do.....	Gov. W. F. M. Army.
17347, 17348	.....do.....	New Mexico.....	Lieut. G. M. Wheeler.
128114	Shoes, Navajo Indian.....	Arizona.....	A. M. Stephen.
166593	Moccasins and leggings, Navajo Indians.	.....do.....	James Mooney.
73908, 73909	Sandals, Merida.....	Yucatan, Mexico.....	Louis H. Aymé.
175185	Shoes, child's.....	Venezuela.....	R. M. Bartleman.
32091	Rubber shoes.....	Central America.....	Hon. E. K. Hart.
32092	.....do.....	.....do.....	Do.
128397	Sandals.....	.....do.....	V. O. King.
127572	Sandals from mummy, fur skin...	Peru (fig. 70).....	W. E. Curtis.
4828	Slippers, wooden sole.....	Brazil.....	W. W. Carter.
4829	Slippers, woman's.....	Lima.....	Do.

SNOWSHOES AND DEVICES FOR TRAVELING OVER THE SNOW AFOOT.

The snowshoe is a device for sustaining the body of one traveling on the top of the snow. It will be seen at a glance to be absolutely necessary to the welfare of hyperborean peoples in walking, hunting, pulling a sled, or in driving a team attached to the sled. Every Arctic culture area has its own use for this article. According to the timber supply and the life to be led, the snowshoe varies from place to place. In association with its kindred implement, the sled, the snowshoe was the apparatus for most rapid land transit known to man before the age of steam.

Snowshoes are of two kinds: (1) Those of wood, the skee or its equivalent; (2) the netted snowshoe. The wooden snowshoe varies from people to people, but there are, in a general sense, but two kinds, the skee proper, or wooden skate (fig. 75), useful in rapid transit, and the compound skee, lined beneath with pelt, useful in draft and also for uphill work (fig. 77).

The smooth skee is to be seen in two forms, one having grooves beneath acting as a keel or keel board, the other being perfectly flat and smooth beneath.

The netted snowshoe grows out of two needs, that of timber sufficiently large and strong from which to make them, and the demand for a footgear that will help the wearer in an emergency to draw a heavy load. There is a great variety of netted snowshoes, the differences

among them depending partly upon the form and quality of the frame, and partly upon the material the kind and fineness of netting.

(1) The simplest form of frame is a hoop of wood, made from a scion or sapling, trimmed very little, and bent into a form more or less round, without crossbars. Examples of this type are shown in pls. 17 and 21.

In the Caucasus and in the Aino country a nearly round frame is made by telescoping one half hoop into another and binding the ends together. In the Adirondacks the wealthy hunters wear a very pretty and costly kind with circular frames.

(2) An advance upon the first form is a hoop or ellipse, with two opposite points drawn toward each other, more in shape of the foot or like an hour glass; also without crossbars. This form has a restricted area and is shown in fig. 76.

(3) A third type does not differ essentially from No. 2, except that the outline is oval and the rear part occasionally constricted, as in a hand glass. The oval form is illustrated by an example in the U. S. National Museum from the northwest coast of America, collected long ago by Captain Wilkes. No. 2728, fig. 92, is the type specimen.

A type slightly differing from No. 3 is from Ungava, eastern Canada. The ellipse is the fundamental form; the rear is constricted into three local varieties, described by Turner, to wit, the beaver tail, the swallow tail, and the round end forms. The Ungava specimens are neatly made, as if by machinery, and they have crossbars and fine webbing of thong and provision for the toes inclosed in a soft shoe.

(4) This type has a frame in one piece, but the front end is bent sharper and the rear ends lashed together, forming a trailer. All of this looped variety in the National Museum have crossbars set in after the manner to be described. The variations in this class of frames are in the turning up or not

of the front, the length of the trailer, and, in the latest voyageur and Canadian examples, the curve of the front.

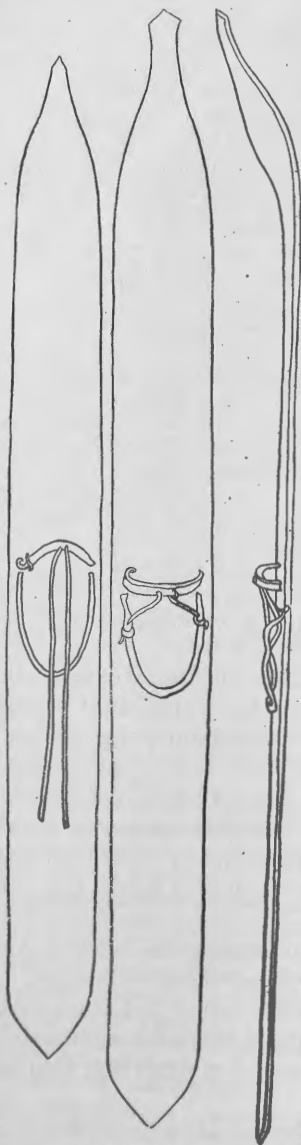


Fig. 75.

WOODEN SNOWSHOES USED BY THE
GILIACS ON THE AMUR.

From a figure in Schrenck's "Reisen und
Forschungen im Amur-Lande."

(5) The Chukchi and the natives of St. Lawrence Island make a frame of two pieces of wood bowed and lashed together at the ends in lenticular form. Anciently, all Eskimos wore this sort of snowshoe. These specimens are necessarily provided with crossbars. There is one example in the National Museum in which a two-part frame is rounded in front and trailed behind. In the Iroquois and Sioux country, and also among the voyageurs, the two-part frame reaches its perfection, being neatly made and gracefully turned up in front.

In order to give room for all questions that may arise in separating snowshoes into their species, and varieties on ethnical, technical, and geographical grounds, the following characteristics must be examined:

1. *Material*.—Driftwood, lumber, sapling, bone, antler, etc.
2. *Outer frame*.—Number of parts, relation to symmetry and the manner in which they are bound together.
3. *Cross section of the frame*.—Round, squared, pointed oval, etc.
4. *Outline and shear*.—Circular, elliptical, oval, pointed oval, lenticular; also flat, warped, turned up, etc.
5. *Crossbars*.—Number, material, form, and attachment.
6. *Netting*.—Rude or woven; wrapped, rove, or worked on a border line; of thong, babiche, twine of sinew, twine of babiche, vegetable twine; toe netting, heel netting, foot netting.

7. *Measurements*.

The netted snowshoe may be traced into the United States quite well to the southward in the States east of the Plains; but it practically disappears from the horse tribes or regions. Old frontiersmen say that the horse Indians were not fond of snowshoes, and did not care to use them.

The snowshoe line southward is on the isotherm of northern New York in winter. There was an abundance of raw material for making them, and the question was one of demand. If the snow was too soft to sustain the wearer, it mattered not how deep it lay, that only made matters worse. There was also a northern limit of good snowshoes. It lay within the Arctic Circle, where the snow became hard enough in the long winter nights to sustain the hunter without them. There, it will be seen, they became poorer as we get farther north.

Snowshoes are not known to have been used south of the Klamath River in California. They are not spoken of as occurring in South America. Here and there further south netted and fur overmoccasins occur.

Nansen¹ mentions in his matchless chapter on the Skee the use of mud boards on the feet for crossing a marsh, and contrasts the lifting of them in stepping with the gliding of the Skee and the peculiar motion of the skater.

The Guaraon, of the Orinoco, run with extreme address on muddy lands, where the European, the Negro, or other Indians except them-

¹"First Crossing of Greenland," London, 1890, I, p. 76.

selves would not dare to walk; and it is, therefore, commonly believed that they are of lighter weight than the rest of the natives. The ease with which they walk in places newly dried without sinking in, when even they have no planks tied to their feet, seemed to me the effects of long habit.¹

The Norwegian snowshoe, skee (called *she*, pl. skier, skilöber, snowshoer; skilöbning, snowshoeing), is a strip of hard wood from 5 to 8 feet long, 4 or more inches wide, and not more than an inch thick, on the average. Many of them are ornamented, but essentially they are pointed and turned up at both ends, having a strap back of the middle for the foot. On the underside may be a groove, acting like a keel or centerboard. The skee was formerly accompanied with the staff, useful especially in steering or guiding the traveler. This type is found in Norway, Sweden, Finland, Russia, and on the Amur. In Kamchatka the sled rests on skees. The Norwegian truger is the counterpart of the netted snowshoe, worn by men and horses and also by Alpine peasants. It is made of an oblong osier hoop, 12 to 16 inches in length, bound to the foot with the simplest lashings.²

Nansen devotes a chapter to the spread of the skee argued on philological grounds. The origin is found thereby in the Altai from Baikal Lake southwestward. He names four types:

1. Sok, tok, hokh, from Japan Sea to Lapland.
2. Sana, tana, hana, among Buriats and northwest Samoyeds.
3. Solta, tolde, among Golde, Tungus, Ostyak-Samoyeds.
4. Lysha, gola, kalku, etc., of Aryan parentage.

In northeastern Siberia outstanding names are given.

The interesting fact is also stated that the transition from the fur-lined to the smooth skee is not abrupt. In Österdalen, Norway, the one on the left foot is long and smooth; the other short and lined beneath with skin. With this may be compared the skater on one foot.³

The great dexterity shown by professionals on this apparatus and its introduction into civilized sport must not be noticed here except to call attention again to the universal tendency of old drudgeries to become by and by pastimes and fine arts. Nor does the skee escape the common lot of apotheoses, since in the Norse mythologies heroes are made to travel on this wise; and it is the boast of a northern chieftain that he could traverse the snow upon skates of wood.⁴

In 1865 Henry Elliott and the Intercontinental Telegraph party traveled 25 miles in two hours across Stuart's Lake, Canada, on skates made from cedar boughs, using blankets for sails.

¹ Humboldt's Travels, London, 1852, Bohn., i, p. 332.

² F. Nansen, "First Crossing of Greenland," London, 1890, Longmans, i, pp. 3, 10, 39, with figure; also Illustrated London News, 1895, 106, p. 172.

³ "First Crossing Greenland," London, 1890, i, Chap. III, pp. 73-114, with figures and map.

⁴ Olai. Worm. Lit. Run., p. 129, cited by Strutt, "Sports and Pastimes of the People of England," p. 153.

Bone skates from Iceland are figured in "The Reliquary,"¹ made from the radius, metatarsal, metacarpal bones of the ox or horse, shaved off to fit the foot on one side and trimmed at the ends on the lower side. Holes are pierced through the ends and a cord is looped through the front hole by its middle. The two ends cross on the instep, pass down to the hole through the heel, where they cross and are brought up to the ankle and fastened around the limb. The bone skate is only a kind of skee. The forward motion is obtained by means of a rod shod with iron or by sailing before the wind.

A Scandinavian, far from home, at Meadow Lake, Nevada County, Cal., has reproduced the skee with a longitudinal groove underneath from end to end, and has sent an example to the Museum of Natural History, in New York.

Rasmus B. Anderson speaks of the Laplander making snowshoes, and also as being expert in the use of the skee, or long wooden snowshoe.²

The kinship of the skee to the sledge, shown in the traveling apparatus of Kamchatka and the Canadian toboggan, is also illustrated by Conan Doyle in a pleasure trip over the Alps: "The guides undid their skier, lashed their straps together, and turned them into a rather clumsy toboggan. Sitting on these, with our heels dug into the snow and our sticks pressed down hard behind us, we began to move down the precipitous face of the pass."³

Hendrick Hamel says that the cold was so intense in Korea in 1662, and there fell such a quantity of snow, that the people made ways under it to pass from house to house; and to go on it they wore small boards like battledores under the feet.⁴

Batchelder must be thinking of still another style used by these northern aborigines of Japan. He says the snowshoes of the Aino are of wood; each consists of a single piece neatly covered with sealskin. They are 5 feet 7 inches long, 7½ inches in breadth, and fastened to the feet by means of a rawhide thong.⁵ They are almost identical with those of the Amur.

Whales abound in the Channel of Manchuria, but are only got by the natives of Saghalin when washed ashore. They sell the oil to the Japanese, and make use of the whalebone for their sledges, bows, and snow-

¹J. Romilly Allen, *The Reliquary*, London, 1896, II, pp. 33-38, quoting Leland's *Itinerary*, London, 1772, VIII, p. 45; Strutt, "Sports and Pastimes of the People of England," and C. Roach Smith, *Archæologia*, XXIX, p. 397. See also R. Munro, *Proc. Soc. Antiquaries of Scotland*, XXVII, p. 185.

²Senate Ex. Doc. 73, 53d Cong., 2d sess., p. 148. See illustration in Frank Leslie's *Monthly*, Feb. 2, 1894.

³McClure's *Magazine*, New York, 1895, IV, p. 352.

⁴Quoted by W. E. Griffis in "Korea, Without and Within," Philadelphia, 1885, p. 114.

⁵Batchelder, "Ainu of Japan," Chicago, 1893, p. 187, with figure. Cf. Schrenck.

shoes.¹ All the Japanese snowshoes in the U. S. National Museum are of the hooped variety.

Examples Nos. 22195 and 22196 are snowshoes sent from Yokohama, Japan, by the Hon. Benjamin Lyman. The frames are hoops of wood drawn together in the shape of a long oval constricted in the middle. The lashing under the foot is made of rawhide thongs. Length, 18½ inches; greatest width, 10 inches. Worn by the Aino, of northern Japan. One of these specimens is shown in fig. 76. In the collection of Romyn Hitchcock, No. 150643, U. S. National Museum, is a pair of Aino snowshoes made of wood and lashed with thong of bearskin. The general shape is an oblong oval. The frame consists of two

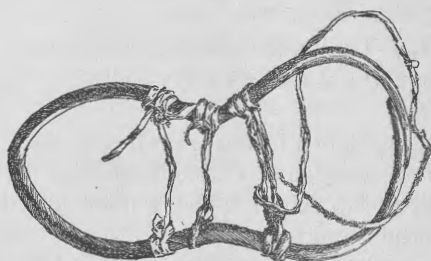


Fig. 76.

RUDE SNOWSHOE FROM YOKOHAMA, JAPAN.

Cat No. 22196, U. S. N. M. Collected by Hon. Benjamin S. Lyman.

bent sticks, rounded at the bends and squared along the limbs. The one forming the heel portion "telescopes" into the other, and the two are lashed together by the webbing of bearskin. This is all of one piece, and passes around the two side sticks by a double loop, as in many American specimens. The knot is the same. Commencing at one margin near the toe the loop is made.

The thong passes diagonally across and makes another loop, then across again and back, so that when completed it makes a monogram of M and W. The toe strap or loop is simply the fastening of the remaining thong. These are worn with fishskin boots.²

In Brockhaus's Atlas of Ethnography, there is figured a snowshoe of the telescoped form used by the Swanen, in the Caucasus, and Hitchcock brought from Tate Yama a telescoped frame with wooden wedges beneath, without foot netting (fig. 93, p. 411).

The Samoyed skees are wider and shorter than the Norwegian, being about 6 feet long and 6 inches wide. They are made of light wood, and have deerskin stretched over the sole. They can make 35 miles a day on their "olen lægia" or "kammus lægia."³

The Giliaks have two kinds of snowshoes—small, lahk; and large, enj. The small snowshoe is made from a thin board without covering, 4½ feet long and 5 to 6 inches wide, bent up and more or less pointed in front. In different regions it assumes modifications of form in the end. These are of universal use as sleds, as shovels, and even as dishes, on a pinch. The large snowshoe is longer, wider, and covered on the bottom with hide of the seal, the hair pointing backward (fig. 77).

¹ Ravenstein, "Russians on the Amur," London, 1861, pp. 323-324.

² Rep. Smithsonian Institution (U. S. Nat. Mus.), 1890, pl. XVII.

³ Jackson, "The Great Frozen Land," London, 1895, p. 69.

⁴ Schrenck, "Reisen und Forschungen im Amur-Lande," St. Petersburg, 1891, K. Akad. d. Wissensch., III, 475, pl. XXXV, 9 figs.

On the Usuri the Yupitatze or Fish Skins hunt only during winter. The snowshoes are planks cut from the pine trees, one-fourth inch thick, 5 inches broad, 6 feet long, sloping upward at both ends, lined beneath with deerskin, and bound tightly to the feet by means of two straps. On these the Yupitatze will skim lightly over the snow, follow the track of the game, and go 20 to 25 leagues in a short winter day. He climbs the mountains with ease. The deerskin is set on with the hair pointing backward, and this serves as a ratchet.¹

The Tungusian snowshoe is a skee, about 5 feet long and 10 inches wide, hewn very thin and bent up at the toes. They are soled with skin from the seal or the legs of the deer or horse, with the hair on and pointing backward.²

At Oudskoi men and boys slide down hill on them, descending steep declivities at almost lightning speed. The snowshoer always carries a staff as a rudder, a brake, and a balance or fulcrum.³

The snowshoes of the Koraks, about Ghijigha, are different from those farther south. They consist of wooden bows, rounded and raised in front, and pointed at the rear, over which a network of seal thongs is interwoven, but very clumsy, and not as buoyant as those used by the Yakuts and Tungus.⁴

This change of snowshoe is the result of natural causes.

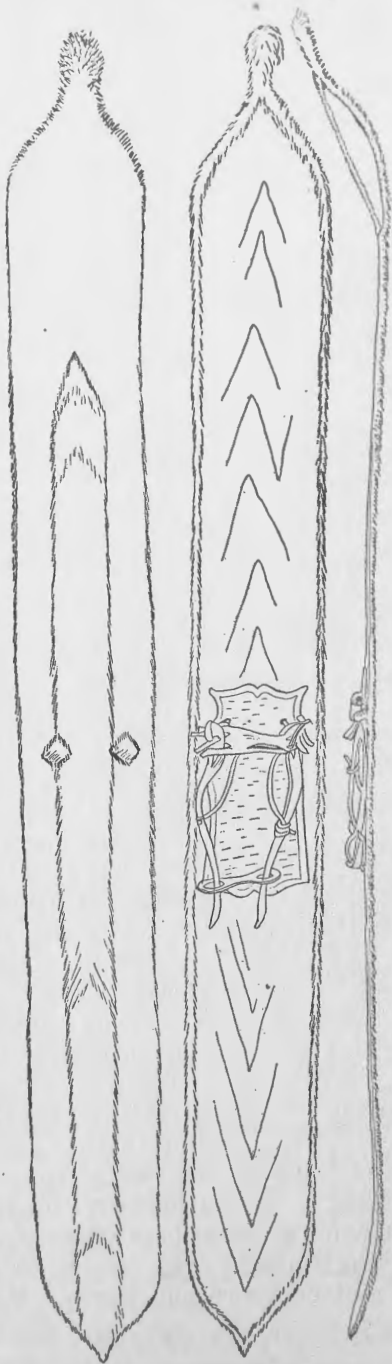


Fig. 77.

WOODEN SNOWSHOES, SHOD WITH SEAL FUR, USED BY THE GILIAKS ON THE AMUR.

From a figure in Schrenck's "Reisen und Forschungen im Amur-Lande."

¹ Ravenstein, "Russians on the Amur," London, 1861, p. 94.

² Bush, "Reindeer, Dogs and Snowshoes," New York, 1871, p. 166.

³ Cf. John Bell, "Lives of Celebrated Travelers." Harper's Magazine, 1835, II, p. 145.

⁴ Cf. Bush, "Reindeer, Dogs and Snowshoes," New York, 1871, p. 356.

There is not enough good, tough wood in all northeast Siberia to make one skee.

The Kamchatkans hunt sable on snowshoes with trained dogs, drive them into holes which they surround with nets, and then, forcing them out with fire and ax, kill them with clubs.¹

The Kamchadale snowshoes are really a necessary accessory to the sled driver to enable him to quit the vehicle for hunting or working about it, and for the protection of the road. They are made of thin board, $4\frac{1}{2}$ feet long, 7 inches broad, sloped to a point at both ends, curved up in front, and arched up a little in the middle. On the underside sealskin is fitted with the hair pointed backward, to serve as a ratchet. The straps are nearer the front. Langsdorff speaks of them as extremely useful in going up and down hill.²

"The Chukchi snowshoes are 2 feet long, broad and flat, front 8 inches wide, tapering to a point behind, where to prevent sinking in the snow a piece of baleen 4 inches wide and 18 inches long is attached. This widening out of the trailer by inserting a wedge-shaped piece is to be seen on New England examples. The nettings are of seal or walrus hide."³

Examples Nos. 2442 and 2443 are two pairs of Chukchi snowshoes from northeast Siberia, collected by Commodore John Rodgers, U. S. N. The frames are of oak roughly squared, the ends are pointed, the fronts turn up, and there are braces or crosspieces of wood and bone. The netting over the central space is of coarse caribou skin, rove through the sides and wrapped about the crosspieces. There is no toe or heel netting. Length, $35\frac{1}{2}$ inches; breadth, $6\frac{3}{4}$ inches. One of these specimens is shown in fig. 78.

The wide Amur type of snowshoe reaches the northern border of the Chukchi country. Of this Nordenskiöld says that a Chukchi man drove past his vessel in February, and offered him a pair of immensely wide skates of their wood, covered with sealskin and raised at both sides.⁴

Of the Chukchi with whom he came in contact, Nordenskiöld says that both men and women use snowshoes in winter. Without

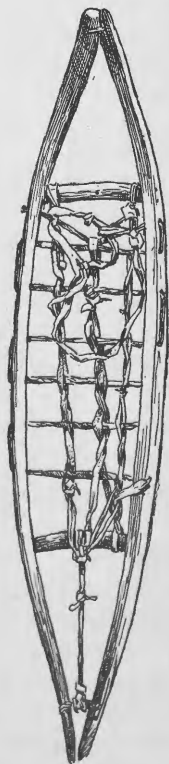


Fig. 78.

COARSE SNOWSHOE WITH
POINTED TOE AND HEEL,
WORN BY THE CHUKCHI OF
NORTHEASTERN SIBERIA.

Cat. No. 2442, U. S. N. M. Collected
by Commodore John Rodgers,
U. S. N.

¹ Kennan, "Tent Life," p. 159.

² Langsdorff, "Voyages," London, 1814, II, p. 291.

³ Hooper, "Tents of the Tuski," London, 1853, p. 184.

⁴ "Voyage of the Vega," New York, 1882, Macmillan & Co., p. 475, with figure.

them they will not undertake willingly any long walk in the snow. The frame of the snowshoe is of wood, and the netting of stout thongs. In the figure given by the author the frame is in two parts, with two crossbars, pointed at both ends and much turned up in front.¹

Examples Nos. 63602 to 63604 (the latter being shown in fig. 79) are snowshoes from Icy Cape. The frames are roughly whittled and pointed at the heel. Netting fine, babiche woven open and strong, and rove through the frame. The foot is supported on strong rawhide thong laid rectangular. Length, 30 inches; width, 10½ inches. Collected by E. W. Nelson.

The Eskimo about Bering Strait make their snowshoe frames from willow and alder, the only growing trees about that vicinity. They are like those just described from the Chukchi area. Indeed, the typical Eskimo snowshoe has always coarse netting. There are two pairs of these double pointed, rude snowshoes from about Bering Strait in the Museum of Natural History, New York. They are in excellent condition, and one of them has a line nicely served extending from the toe point to the front bar. The netting is of coarse thong, and forms regular parallelograms under the feet. These have been examined through the courtesy of Professor Putnam and Mr. Marshall Saville.

Example No. 15605 is a set of three snowshoe frames from Ponook, a little island east of St. Lawrence Island, Bering Sea, collected by Henry W. Elliott. They are short, made of two pieces, thin and straight, in cross section. The braces are broad and flat, ends pointed and sharply curved up in front. The lashing is with thongs of seal or walrus hide. Length, 21 inches; breadth, 9 inches. Other examples, collected by E. W. Nelson (Nos. 63236, 63242), are nearly flat, the frame coarsely made in two pieces, the netting of walrus-hide thong. An average length is 4½ feet.²

The Innuite snowshoe is small and nearly flat, seldom over 30 inches long. They are always rights and lefts. Ingalik, larger; Kutchin, same

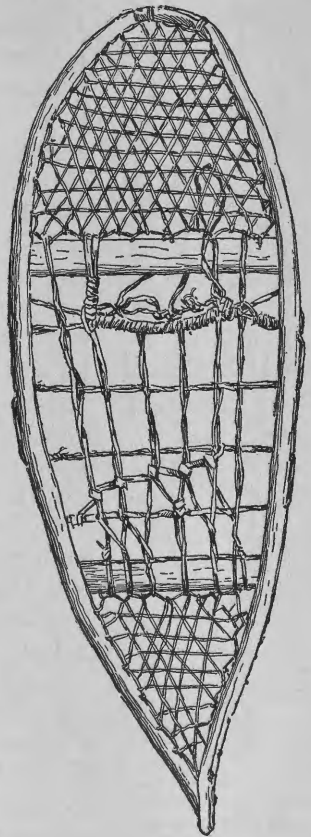


Fig. 79.

NETTED SNOWSHOE FROM ICY CAPE,
ALASKA.

Cat. No. 63604, U. S. N. M. Collected by E. W.
Nelson.

¹ "Voyage of the Vega," New York, 1882, Macmillan & Co., p. 475.

² See also Whympster, "Travels and Adventures in the Territory of Alaska," p. 183.

style; Hudson Bay, 30 inches in length.¹ They are from 2 to 3 feet long, 1 foot broad, and slightly turned up in front.²

Example No. 48092 (fig. 80) is a pair of snowshoes from Cape Darby, Alaska, north of Norton Sound, collected by E. W. Nelson. Frame in two pieces, rounded in cross section, and cut small in front. The toe is rounded and sharply curved up; heel pointed. The foot netting, strong seal-thong rove through the frame. Both shoes are alike. Length, 36 inches; width, 10½ inches. This coarse shoe is a connecting link between the ruder Asiatic and the finer Athapascan forms. In this one the round toe has taken the place of the pointed toe, and there is a trace of toe netting.

Example No. 48103 is a pair of snowshoe models from Norton Bay, Alaska, collected from the Mahlemut Eskimo by E. W. Nelson. The frame is rounded, in section, wide in front, and strongly curved up. The netting is of deerskin thong twisted into twine. Length, 19½ inches; width, 4½ inches.

Example No. 45400 (pl. 11) is a pair of snowshoes from Norton Sound, Alaska, collected from the Ingalik Indians (Kai yuh kha tana) by E. W. Nelson. The frame is made of two pieces spliced in front and rounded in section. The netting is made of deer sinew twisted and attached to loops rove through the frame; strongly curved up in front and pointed at the heel. They are rights and lefts, a slight difference being made in the frames. The method of attaching by the toe and heel loop is described by Murdoch, page 391. Length, 46 inches; width, 10½ inches. In the transition from the rectangular and shapeless meshes to hexagonal meshes in the three spaces, this specimen fills a gap. The toe netting is tolerably good hexagonal weaving. The foot netting is still as poor as any of its square-woven type, and the heel space is filled with a warp of thong converging at the trailer, held in position by a line of "bird-cage" weaving athwart its middle.

The Kai yuh kho tana of Dall and Ingalik of the Russians (a corruption of the native or Eskimo word meaning Indians) occupy the low tundra on and about the Yukon and the Kuskokwim. They are Athapascan. Dall says that their habits vary with their environment, some being fishermen, others hunting the moose and the deer. On the Yukon the southernmost settlements trade dry fish and wooden ware, in making

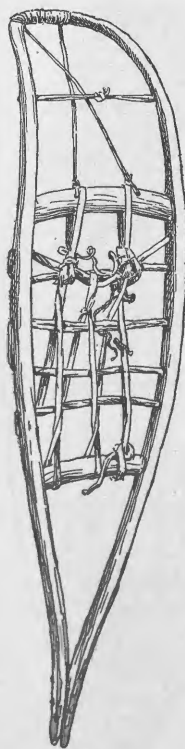


Fig. 80.

NETTED SNOWSHOE FROM
CAPE DARBY, ALASKA.
Cat. No. 48092, U. S. N. M. Col-
lected by E. W. Nelson.

¹ Dall, "Alaska and its Resources," pp. 190-191.

² Seeman, in "The Zoology of the Voyage of H. M. S. *Herald* during the years 1845-51," London, 1853, II, p. 60.

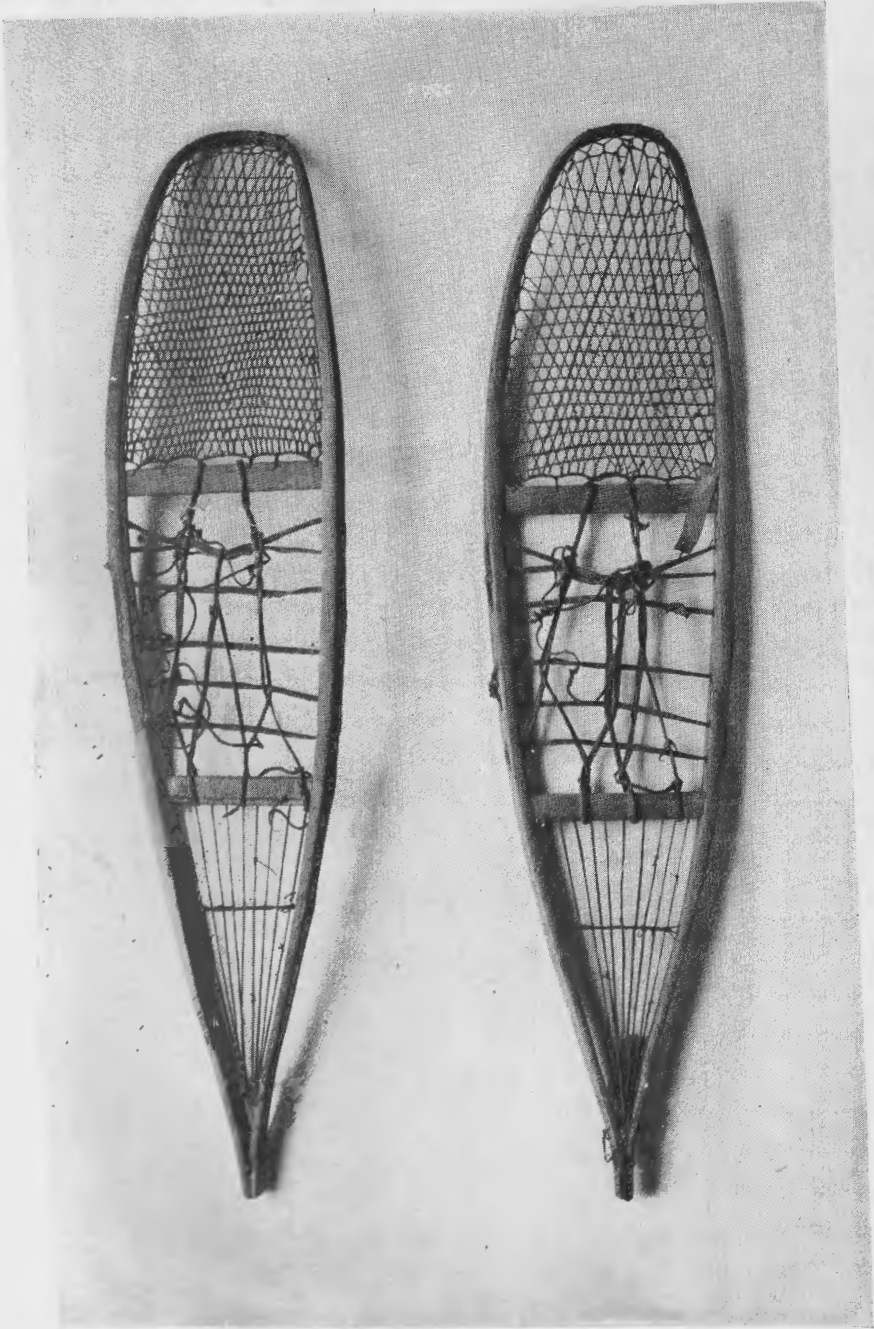
EXPLANATION OF PLATE 11.

NETTED SNOWSHOES.

These specimens are somewhat short and wide. The frames are of two pieces of wood, spliced in front, round in cross section and turned up at the toe, having pointed heel and crossbars let into the frame. The perforations of the frame for the cord to which the netting is attached, are in pairs, separated on the inside and coming together on the outside just below the surface, so that the foundation thong may be tied in a series of single knots, concealed on the outside and forming a line of loops on the inside of the frame.

The netting or filling in front is in hexagonal weaving through the foundation thong above mentioned. The netting in the rear space consists of ten filaments passing through the vertical holes in the rear of the hindmost crossbar, and converging toward the heel where they are fastened off in the thong that binds the frame together. Midway of these longitudinal filaments a cross thong is wrapped in bird-cage style to hold them in place. The netting in the foot space is of stout thong, rove through the frame at the sides and running parallel. It is wrapped twice about the front crossbar and four times about the rear crossbar or cross lashing, making meshes which are a compromise between rectangular and hexagonal weaving. Norton Bay, Alaska. Collected by E. W. Nelson.

(Cat. No. 45400, U. S. N. M.)



NETTED SNOWSHOES.
Norton Bay, Alaska.

EXPLANATION OF PLATE 12.

NETTED SNOWSHOES.

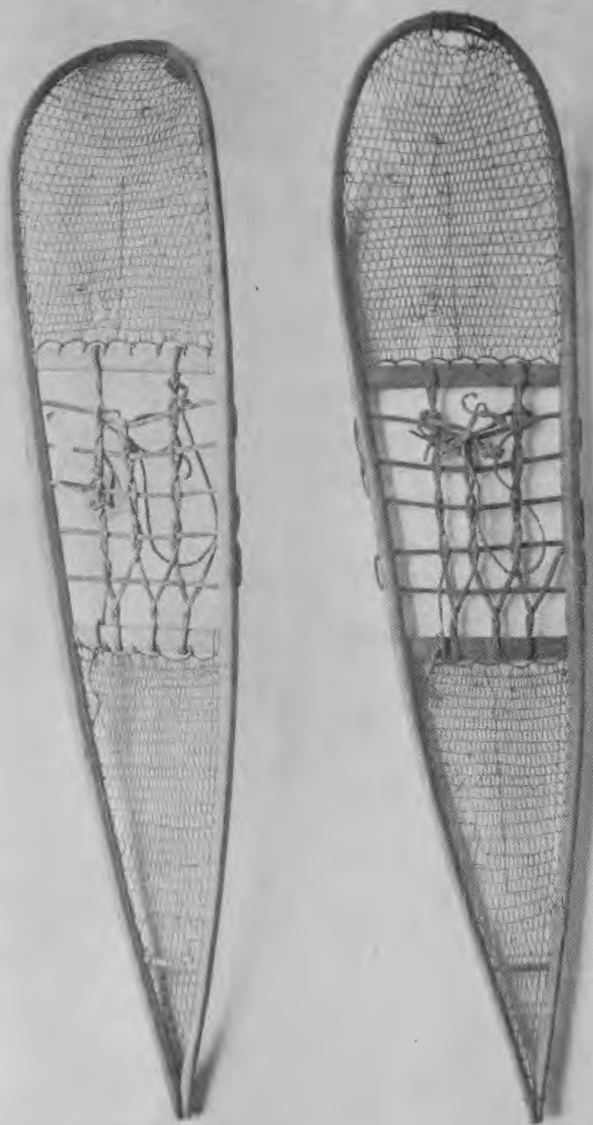
These shoes are broad in front. The frames are made of two pieces of rounded wood, spliced and turned up at the toe, pointed at the heel, and having three crossbars let into the frame. There are perforations in the frame around the front space and hinder spaces passing vertically through a keeled projection, as in lacrosse sticks. The frame alongside the middle of the foot space has six holes bored quite through for the cross lashing. The main crossbars have vertical perforations on the margins away from the foot space. The short crossbar is not perforated and the frame sticks do not bulge out at this point.

The netting, front and rear, is of babiche in hexagonal weaving, done into a set of loops around the inner margin of the frame and tied by single knots into V-shaped perforations.

The foot netting is of stout rawhide in parallel or rectangular weaving, the fore-and-aft lines being doubled and twisted about the transverse set. This specimen is a transition form between the irregular and the hexagonal style of footing.

Ingalik of Nulato, Alaska. Collected by E. W. Nelson.

(Cat. No. 49099, U. S. N. M.)



NETTED SNOWSHOES.
Ingalik of Nulato, Alaska

which they are very expert, and strong birch bark canoes with the upper Yukon and Shageluk people.

Example No. 38873 is a pair of snowshoes from the mouth of the Yukon River, Alaska, collected from the Eskimo by E. W. Nelson. They are nearly flat, the frame rounded in section and roughly made. Toe rounded, heel pointed. Toe and heel netting destroyed, but formerly made of sinew twine; the foot netting of hide thong. Both shoes alike. Length, $36\frac{1}{2}$ inches; width, $9\frac{1}{2}$ inches. The noteworthy feature in these specimens is the manipulation of the foot thong, which is rove through the front crossbar and the sides of the frame, and is carried around the hind crossbar. The first meshes in the rear are suggestive of hexagonal weaving, but this design is arrested by the second cross line, and the six fore and aft strands are made parallel in pairs. These by simply rising and falling as in a common warp hold the cross lines from sagging. The rest under the ball of the foot is simple and effective, and affords an explanation of the more elaborate construction of this part elsewhere.

Example No. 49099 (pl. 12) is a pair of snowshoes from Nulato (64° , $40'$, 158° , NW.), Alaska, collected from the Ingalik Indians (Athapascan) by E. W. Nelson. Round toe, strongly curved up; long, pointed heel. Toe and heel netting of twisted deer sinew; foot netting and foot loop of thong. Rights and lefts. Example No. 8812, collected by Dall, is similar to the foregoing. The short crossbar near the trailer should be noticed as leading up to a similar device further on with a new function.

Example No. 127941 is a pair of snowshoes from Putnam River, Alaska, collected by Lieutenant Stoney, U. S. N. The frame is in cross section, rounded at the toe and curved up; the heel is long and pointed; toe and heel netting of twined deer sinew; the foot netting and loops of strong walrus-hide thong. Length, 54 inches; width, $8\frac{1}{2}$.

Simpson, in his journal, says that snowshoes are so seldom used in the North where the drifted snow presents a hard surface to walk upon that not half a dozen pairs were in existence at Point Barrow at the time of his sojourn (1853-55),¹ and those were of an inferior sort. Murdoch thinks the Point Barrow Eskimo learned to make the finer sort from the people of Kuwuk River, who have trading relations with the Indians, and in Simpson's time the Kuwuk people used the Indian shoe. Murdoch thus describes the present Point Barrow shoe:

Snowshoes (tâglu) of a very efficient pattern and very well made are now universally employed at Point Barrow. Although the snow never lies very deep on the ground, and is apt to pile up in hard drifts, it is sufficiently deep and soft in many places, especially on the grassy parts of the tundra, to make walking without snowshoes very inconvenient and fatiguing. I have even seen them used on the sea ice for crossing level spaces when a few inches of snow had fallen. Each shoe consists of a rim of light wood bent into the shape of a pointed oval, about five times as long as the greatest breadth, and much bent up at the rounded end, which is the toe. The sides are braced apart by two stout crossbars

¹ Simpson, "Narrative of Discoveries of the North Coast of America," p. 243.

(toe and heel bar), a little farther apart than the length of the wearer's foot. The space between these two bars is netted in large meshes (foot netting), with stout thong for the foot to rest upon, and the spaces at the ends are closely netted with fine deerskin "babiche," or sinew thread (toe and heel netting). The straps for the foot are fastened to the foot netting in such a way that while the strap is firmly fastened round the ankle the snowshoe is slung to the toe. The wearer walks with long, swinging strides, lifting the toe of the shoe at each step, while the tail or heel drags in the snow. The straps are so contrived that the foot can be slipped in and out of them without touching them with the fingers, a great advantage in cold weather.

Example No. 88912 is a pair of snowshoes from Point Barrow collected by Captain Ray and described by Murdoch. (Fig. 81.) The rim is of willow, 51 inches long and $10\frac{1}{2}$ inches wide at the broadest part, and is made of two strips about 1 inch thick and three-fourths of an inch wide, joined at the toe by a long lap-splice, held together by four short horizontal or slightly oblique stitches of thong. Each strip is elliptical in section, with the long axis vertical, and keeled on the inner face, except between the bars. Each is tapered off considerably from the toe bar to the toe, and slightly tapered toward the heel. The two points are fastened together by a short horizontal stitch of baleen. The tip is produced into a slight trailer, and the inner side of each shoe is slightly straighter than the outer—that is to say, they are "rights and lefts."

The bars are elliptical in section, flattened, and have their ends mortised into the rim. They are about a foot apart, and of oak, the toe bar 9.2 inches long and the heel bar 8.5. Both are of the same breadth and thickness, 1 inch by one-half inch. There is also an extra bar for strengthening the back part of the shoe 10 inches from the point. It is of oak, 4.8 inches long, one-half inch wide, and three-tenths of an inch thick (fig. 82). The toe and heel nettings are put on first. Small equidistant vertical holes through the frame run round the inside of each space. Those in the rim are drilled through the keel already mentioned, and joined by a shallow groove above and below. Those in the bars are about one-half inch from the edge and joined by a groove on the

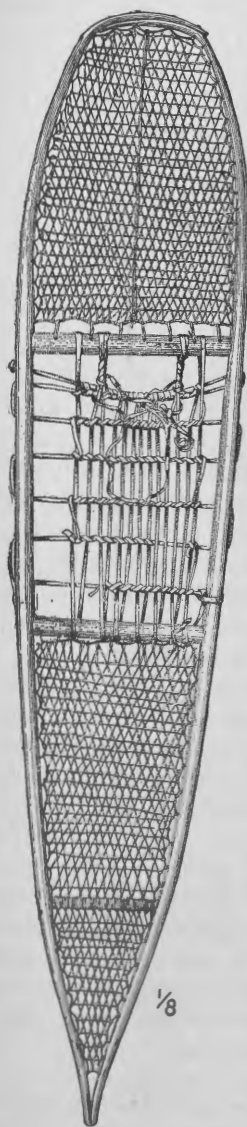


FIG. 81.

FINELY NETTED SNOWSHOE FROM
POINT BARROW, ALASKA.

From a figure in the Sixth Annual Report
of the Bureau of Ethnology,
Vol. No. 88912, U. S. N. M.

under side of the toe bar only. Into these holes is laced a piece of babiche, which is knotted once into each hole, making a series of beackets about three-fourths of an inch wide round the inside of the space. There are no lacing holes in the parts spliced at the toe, but the lacing passes through a bight of each stitch. At the toe bar the lacing is carried across from rim to rim about three times, the last part being wound round the others.

On the left shoe the end is brought back on the left-hand side, passed through the first hole in the bar from above, carried along in the groove on the underside to the next hole, up through this and round the lacing, and back through the same hole, the two parts being twisted together between the bar and lacing. This is continued, "stopping" the lacing in festoons to the bar, to the last hole on the right, where it is finished off by knotting the end round the last "stop."¹

Example No. 89913 is a pair of snowshoes from Point Barrow, shorter and broader than those just described. The hinder bar is of walrus ivory. They are 48½ inches long and 11 broad. The two shoes are not perceptibly different in shape. The lacing, which is of sinew braid, is put on in the same way as on the preceding pair, except that it is fastened directly into the holes on the toe bars. The whole of the heel netting is in one piece, and made precisely in the same way as the point nettings of the first pair, the end being carried up the middle to the point of the heel, and brought down again to the bar, as on the toe nettings, but fastened with marling hitches. The number of strands is the same in each shoe—twenty-three in each set. The toe nettings follow quite regularly the pattern of the preceding pair.

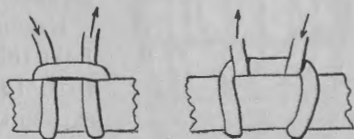


Fig. 82.

KNOT ON REAR CROSS BAR OF ESKIMO SNOWSHOE.

From a figure in the Ninth Annual Report of the Bureau of Ethnology.

The shoes are not quite the same size, as the right has 35, 35, and 28 strands, and the left 33, 33, and 25, in each set, respectively. There is no regular rule about the number of strands in any part of the netting, the object being simply to make the meshes always about the same size. The foot netting is made of stout and very white thong from the bearded seal. These shoes have no strings.

No. 89914 [1738] is a pair of rather small shoes from Utkiawwĩñ, one of which is shown in fig. 83. They are rights and lefts, and are 42 inches long by 10 broad. The frame is wholly of oak, and differs from the type only in having no extra hind bar, and having the heel and toe bars about equal in length. The points are fastened together with a treenail, as well as with a whalebone stitch. The heel nettings are put on with perfect regularity, as on the pair last described, but the toe

¹Cf. Murdoch, Ninth Ann. Rep. Bureau of Ethnology, pp. 344-352, figs. 350-354, for minute details of making and weaving.

nettings, though they start in the usual way, do not follow any regular rule of succession, the rounds being put on sometimes inside and sometimes outside of the preceding, till the whole space is filled. The foot nettings are somewhat clumsily made, especially on the right shoe, which appears to have been broken in several places, and "cobbled"

by an unskillful workman. There are only five transverse strands which are double on the left shoe, and the longitudinal strands are not whipped to these, but interwoven, and each pair twisted together between the transverse strands. There is no wattling back of the toe hole, and one pair of longitudinal strands at the side of the latter is not doubled on the left shoe. The strings are put on as on the type, except that the ends are knotted instead of being spliced. This pair of shoes was used by Mr. Murdoch during the winters 1881-82 and 1882-83, while serving on the International Polar Expedition as naturalist and observer.

Example No. 38874 is a pair of snowshoes from Lake Iliamna (59°, 154°, NW.), Alaska, between Bristol Bay and Cooks Inlet, and at the eastern extremity of Alaskan Peninsula, collected from the Kenai Indians by E. W. Nelson. Frame rounded in section, netting of deer-sinew twine rove through the frame. Toe round and strongly curved up; heel pointed. Rights and lefts. Length, 51½ inches; width, 12¼.

Examples Nos. 72240 and 72241 (pl. 13) are snowshoes from Bristol Bay, Alaska, collected from the Indians (Tinné). The frame is square in section, toe rounded and strongly curved up, heel long and pointed. Toe and heel netting of twined deer sinew, foot netting of strong raw-hide thong, all rove through the frame. They are rights and lefts, and have the typical toe and heel straps. Length, 44 inches; width, 9¾.

Example No. 63558 (pl. 14) is a pair of snowshoes collected at Sitka, Alaska, by J. J. McLean. It must be remembered that Sitka is the marine

entrepôt for all the surrounding region. Trade goes to the interior of the continent up Lynn Canal and Chilkat River, and over the passes to the headwaters of the Yukon River. The snowshoes here described, and others, therefore, are Tinné, or Athapascan. The long, slender frame, rounded section, round toe bent up, and long, tapering heel are typical. Toe and heel netting of babiche close and fine. Foot

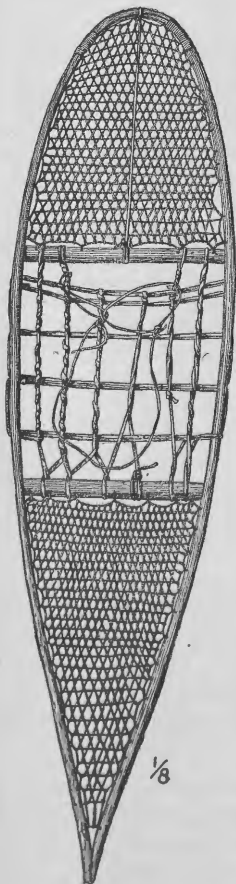


Fig. 83.

SMALL NETTED SNOWSHOE FROM
POINT BARROW, ALASKA.

From a figure in the Ninth Annual Report
of the Bureau of Ethnology.

Col. No. 28914, U. S. N. M.

EXPLANATION OF PLATE 13.

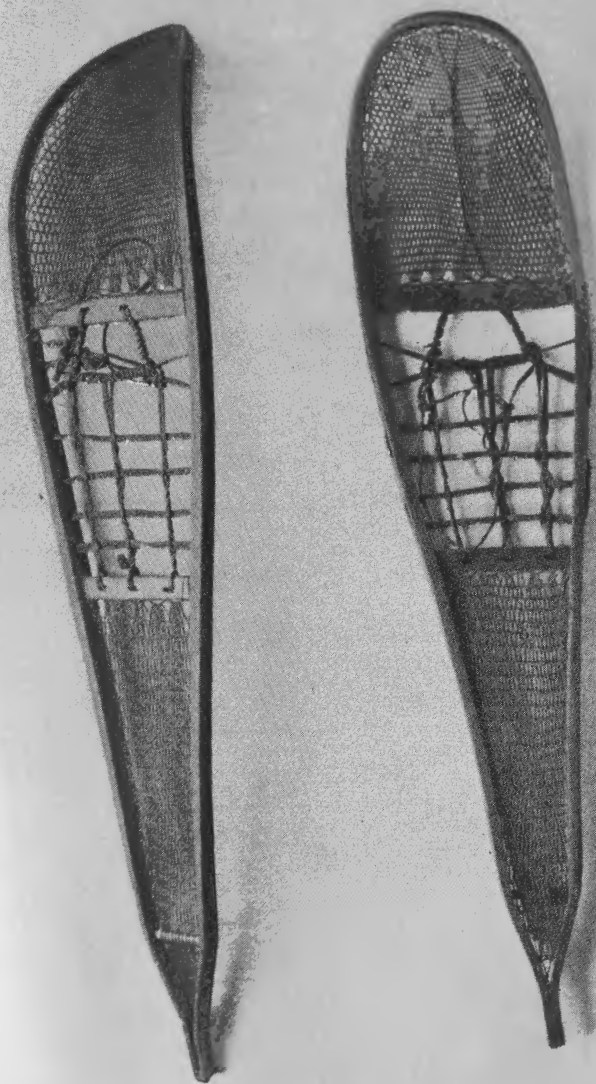
NETTED SNOWSHOES.

These specimens are not mates. They are spatulate in form, each space having its peculiar shape. The frame is in two pieces neatly spliced in front, round in section, much turned up at the toe, long pointed at the heel, and has three crossbars let into it. In this example each crossbar modifies the outline. There are V-shaped perforations about the front and rear spaces, in the middle of the long crossbars, as well as in their outer margins, and quite through the frames alongside the foot space. The short crossbar is not perforated.

The netting is hexagonal in front, built up on a thong knotted into V-shaped perforations of the frame and into the vertical perforations of the crossbar. In the rear space, owing to its elongated triangular form, the weft, as it might be called, is twined once from warp to warp, which is neatly let into V-shaped borings through the frame. In this Bristol Bay type the foot rest is in rectangular weaving with double and twisted longitudinal filaments. The rest for the ball of the foot and opening for the toes is formed by neatly wrapping the rawhide thong at this point.

Bristol Bay, Alaska. Collected by Charles L. McKay.

(Cat. No. 72421, U. S. N. M.)



NETTED SNOWSHOES.
Bristol Bay, Alaska.

EXPLANATION OF PLATE 14.

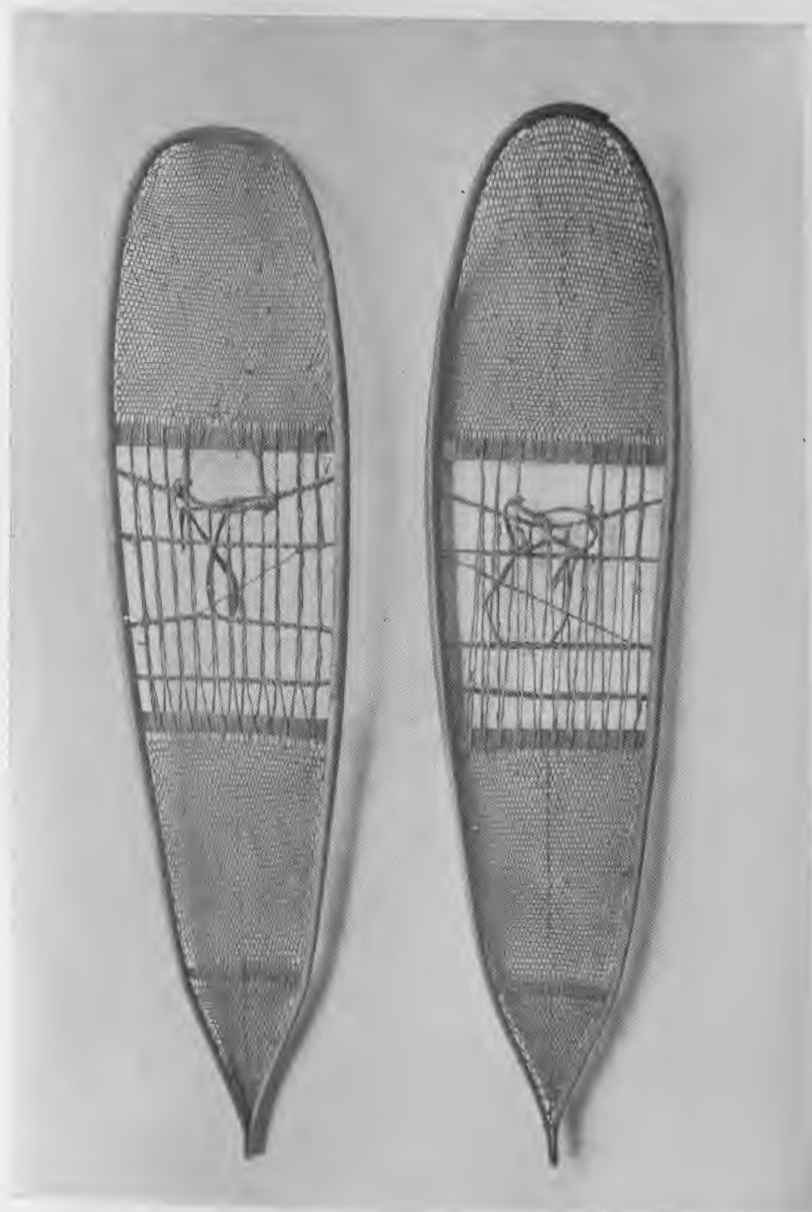
NETTED SNOWSHOES.

These specimens are leaf-shaped, suddenly tapering at the heel, and are not mates. The frames are in two pieces, spliced and neatly wrapped in front, pointed oval in section, and well turned up at the toe. This is much more the case in one specimen than in the other. They are bluntly pointed at the heel and have three crossbars. The perforations of the frame run vertically through a keel on the inner side of the front and hind space quite through at the sides of the foot space, while there are none whatever in the crosspieces, except a long slit for obvious reasons in front of the toe openings.

Netting, hexagonal, front and rear, and quadrangular in the foot space. The leaf-shape and the abrupt heel curve should be noted.

Sitka, Alaska. Collected by J. J. McLean.

(Cat. No. 63558, U. S. N. M.)



NETTED SNOWSHOES.
Sitka, Alaska.

EXPLANATION OF PLATE 15.

NETTED SNOWSHOES.

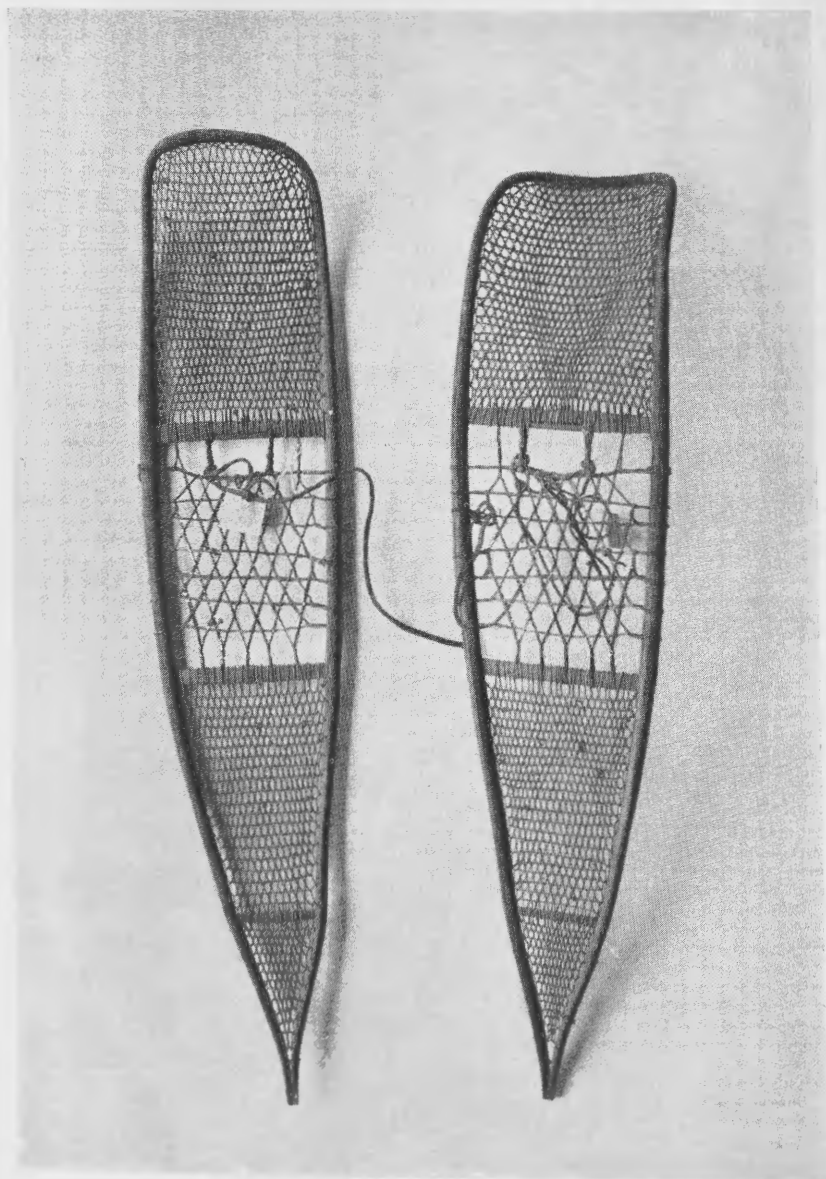
These specimens are long and irregular. The frames are in two pieces, spliced and lashed together in front, pointed oval in section, and much turned up at the toe, having three crossbars and being wedge-shaped behind the third. The perforations of the frame around the front and rear spaces are vertical. There are no perforations for the foot lashing in the frames or crossbars. A slit is cut in the front crossbar before the toe space.

Netting, in hexagonal weaving, done on a thong knotted into the vertical perforations and about the long crossbars. Foot netting, in coarse hexagonal weaving wrapped about the crossbars and frame. Extra thong and wrapping form the rest for the ball of the foot and toe space.

Sitka, Alaska. Collected by J. G. Swan.

(Cat. No. 20783, U. S. N. M.)

NOTE.—Snowshoes are not worn in Sitka. Specimens brought there are from the Chilkat country and the head waters of the Yukon.



NETTED SNOWSHOES.
Sitka, Alaska.

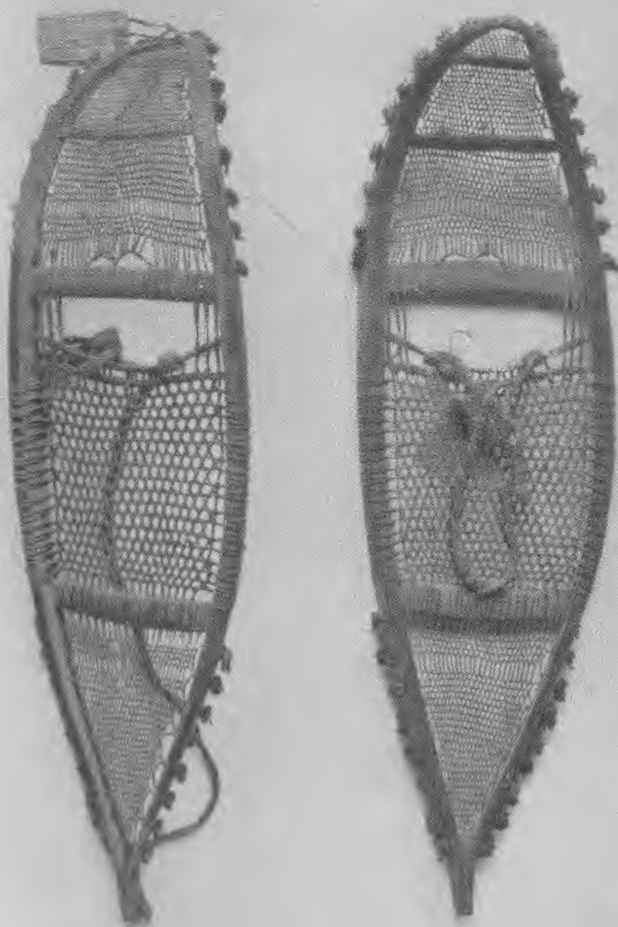
EXPLANATION OF PLATE 16

NETTED SNOWSHOES.

The frames are of two pieces of wood squared and tapered, spliced and lashed together in front, nearly sharp and much turned up at the toe, pointed at the heel with short trailers. There are four crossbars, three of which are in front. The perforations of the frame are V-shaped in front and rear, and wanting about the foot space, excepting three in the crossbar in front of the foot lacing.

The netting in all the spaces is hexagonal, and of different fineness. In the front and rear spaces, by omitting cross threads and twining the diagonals, a beautiful lace-work effect is produced. The lacing of the foot rest is about the framework, excepting the two front cross lines under the ball of the foot. These are rove through the frame, doubled and twisted. The decorations are tufts of red yarn gathered into the knots of the thong into which the network is done. The device to prevent the toe of the moccasin from wearing the loops of the front netting is noteworthy.

Fort Simpson, Mackenzie River District. Collected by B. R. Ross.
(Cat. No. 5647, U. S. N. M.)



NETTED SNOWSHOES.

Hudson Bay Company's pattern. Fort Simpson, Mackenzie River District, Canada.

netting of raw hide rove through the frame. Painted and ornamented with beads. Rights and lefts. Length, 49 inches; width, 11 $\frac{3}{4}$.

A second pair, collected by McLean from the Chilkat, has the netting of sinew twine instead of babiche (No. 72462).

Example No. 20783 (pl. 15) is also Chilkat, collected in Sitka by James G. Swan, the lacing being of sinew twine. Paymaster Webster collected here a specimen, No. 127614, of the three-brace type, the netting of babiche. The Emmons collection in the Museum of Natural History, New York, contains an excellent example of the Chilkat transitional type of snowshoes. The frame is in two pieces, Athapascan in type, much curved up at the toe, and even incurved or emarginate at the extreme front. The toe and the heel netting are of babiche, and not of sinew thread. The foot netting is of coarse rawhide thong, but is woven with hexagonal mesh. Underneath the inner margin of each shoe the black tip of a goat horn is lashed so as to incline backward and catch in the snow. It is in this respect unique.

Example No. 20783 is a pair of snowshoes procured in Sitka by J. G. Swan. They are of great interest in this connection. The frame and crossbars conform to the customary plan of the Kutchin snowshoe. At the heel the crossbar marks, as in other examples, a sudden change in the curve. The toe is properly turned up. But in one particular the shoe is typical. The network is not of coarse rawhide laid in quadrangular meshes, but is coarsely woven in the hexagonal mesh. The specimen is in fact a transition between the Eskimo foot netting and the refined hexagonal netting of the interior, which grows more and more delicate and symmetrical as the Siouan, Chippewa, and Iroquoian areas across the boundary between Canada and the United States are reached where steel knives are in vogue.

Example No. 1974 is a pair of snowshoes from the Chippewayan Indians, Mackenzie River, collected by B. R. Ross, used as far as the Arctic Coast. The frames are squared in section, in two pieces, pointed at both ends, sharply curved up in front. Netting of babiche, close and fine, the foot netting being wrapped about the frame and coarser than the rest. The frames are painted and ornamented with tufts of worsted on the outside. Length, 33 $\frac{1}{2}$ inches; width, 7 $\frac{1}{2}$ inches. Mr. Ross also collected examples Nos. 2046 and 5647 (pl. 16), model of Chippewayan shoe used as far north as the Arctic Coast by the Hudson Bay Company's voyageurs.

Robert Kennicott collected among the Yellow Knife Indians at Fort Resolution, Canada, a pair of the pointed models just described, example No. 2045, and examples Nos. 860, 861, and 5646 at Fort Good Hope. Of these he says that those of smaller size are for walking behind dog sledges. He also says that the voyageurs sometimes use the round-toed shoe, but that they prefer the pointed kind.

In the Catlin collection, example No. 73310 National Museum, is another example of this type. The foot lacing wrapped about the frame

is protected by an additional seizing of cloth. The shoes are fastened to the feet by a soft strip of deerskin instead of the hard thong.

Mackenzie says of the Chippewayan that their snowshoes are of superior workmanship. The inner part of the frame is straight, the outer one is curved, pointed at both ends, and turned up in front. They are also laced with great neatness with thongs made of deerskin.¹ Especially noteworthy in this connection is the squared frame, lenticular outline pointed at both ends, the number of crossbars in front, the close netting in the foot space, and the soft band of the foot straps.

An old, worm-eaten specimen in the National Museum from the Catlin collection exhibits the ingenious manner in which the frames are bored for the cord or line to sustain the toe and heel netting. It will be remembered that in the Athapascan type the holes are usually vertical through a keel or molding on the inside of the frame. But in the Voyageur specimens, which are an Algonquian intrusion into an Athapascan area, two small holes are made in the frame, at the middle of the inner face, near together, and so inclined as to meet about the middle of the wood on the outer face. One of the holes continues on through to enable the workman to push the thread through and back, coming out at a hole other than the one in which it entered. The thread is then pulled tight and tied in a single knot. This laborious process is repeated at intervals of an inch on the frames for the foot and heel netting. The holes in the crossbars are bored down straight through.

The sort of weaving practiced on all the Athapascan and Algonquian snowshoes is paralleled in the cedar bark weaving of the north Pacific Coast and in Japan. The filaments pass in three directions, crossing each other at an angle of 60 degrees and leaving hexagonal interstices. But in the old example now considered, features of textile work are introduced that are seen in the net work of the Yuma tribes of southern California, and thence southward, also in grass work from the Aleuts, and occasionally in bark work from the Pacific Coast. The regular three direction or hexagonal weaving is interrupted here and there by the omission of a cross filament. In such case the two diagonal filaments make a half turn, a whole turn, a turn and a half, and so on about each other, leaving elongated hexagons flanked by twine. By an alteration in the spacing along the crossbar, rows of wider spacing are carried diagonally across the netting.²

The Cree snowshoe is flat, squared off in front, sharp behind, has two broad crossbars, and is finely netted in the three spaces.

The Chippewayan snowshoes are of superior workmanship, and are rights and lefts, pointed at both ends, turned up in front, and laced with thongs of deerskin.

Example No. 1975 is a pair of snowshoe models. **Frames rounded**

¹Mackenzie, "Voyages from Montreal through the Continent of North America," Philadelphia, 1802, p. exx.

²Compare figures of carrying baskets from Japan and figure 92.

in cross section, toe rounded and slightly curved up; long, broadened heel, terminating in short, sharp point. Toe and heel netting of babiche, or fine line cut from deer hide. Foot netting of rawhide thong, painted red by rubbing with earth and ornamented with beads. Length, 21 inches; width, $4\frac{3}{8}$; collected on the Yukon River from the Koyukon Indians (Athapascan) by B. R. Ross and W. L. Hardisty. Example No. 5569 from the Koyukon, collected by W. H. Dall, differs little from the above.

Examples Nos. 7470 and 7471 are snowshoe models from the Kutchin Indians, Fort Anderson, northern Canada, collected by R. MacFarlane. Frame rounded in cross section; toe round pointed, sharply curved up; broad heel, terminating in sharp, short point. Netting of babiche, close and fine, rove through frame. Foot net of babiche, but coarser and more open. The frames are painted and the netting is ornamented with beadwork in blue, red, and black. Length, 33 inches; width, 9. Especial attention is asked to the fact that east of the Yukon drainage the foot netting changes and becomes like that of the toe and the heel space, while those already described have the foot netting like the Eskimo and Aino types.

Example No. 1330 is a pair of snowshoe models from the Kutchin Indians, on the Yukon River, collected by Robert Kennicott. The frame is rounded in cross section. Toe rounded and slightly curved up; heel abruptly tapered from a short crossbar. Toe and heel netting of babiche, close and fine. Painted and ornamented with line of blue and red beads in middle of toe and heel netting. Length, $29\frac{1}{2}$ inches; width, $5\frac{1}{2}$. Another example, No. 896, from Peels River, collected by R. Kennicott and C. P. Gaudet, possesses the same characters.

Example No. 877 is a pair of snowshoes from La Pierre House, Rocky Mountains. Frames rounded in section; toes round and strongly turned up; heel terminating abruptly from short crossbar. Toe and heel netting of babiche, closely woven; foot netting of rawhide rove through frame and about the crossbars; they are rights and lefts; collected by Robert Kennicott. They are worn by the Loucheux Indians, of Canada. None of these people use the voyageur pointed shoe. According to Kennicott the small amount of underbrush in the woods renders the pointed shoe unnecessary. The type of snowshoes is essentially Athapascan. They are found in Alaska, inland all around the coast, but they are essentially Indian, though found with Chilkats or with Eskimo on the Yukon or at Point Barrow. The framework is not of driftwood, but of alder, birch, or willow, cut green and seasoned into shape. Each frame is in two parts, rounded and spliced at the toe, pointed at the heel and held into form by flat oval crossbars let into the sides. The number of bars varies, and it is quite common to notice a short bar near the heel let into a gash or "saw cut," at which point the frames are abruptly bent toward each other. The amount of upcurve at the toe varies greatly. In some localities the shoe is nearly

flat, in others the toe stands up more than 6 inches. The cross section is well noted by Murdoch, being an elongated ellipse standing vertically, with the middle of the inner side angular or keeled to admit of the vertical perforations through which is rove and knotted the line or thread on which the netting is built up. Of the netting of these shoes the toe and heel fabric is similar in all. The foot webbing is partly Eskimo or Asiatic, and partly of Southern type. The reason is plain. The thinner the shoe sole, the finer the webbing must be. The moccasin is the occasion of the finer and finer web of the South under the foot. The material in some examples is of sinew thread or twine, in others of babiche or finely cut deerskin dressed. In those areas where the deerskin is not depilated the sinew thread is used.

Snowshoes in the Barren Ground country of Canada are made of birch wood and babiche. The former is cut wherever and whenever opportunity offers, the trapper never losing a good specimen. The wood is worked into shape at leisure. The babiche is cut by the women, who spend their leisure thereat, very much as our women do at knitting.

C. W. Whitney, in Harper's Magazine, figures a pair of snowshoes from the Saskatchewan,¹ which are a compromise at the toe between the Athapascan round toe and the Hudson Bay sharp toe.

The carriers on Stuart Lake, British Columbia, are Athapascans, and are said by Father Morice to have four styles of snowshoes (aih) under different names.

(1) Khé la pas (moccasin end rounded). Frame in one piece, pointed oval, long with trailer, similar to the Algonquian and Iroquoian shoes about Quebec and Montréal; the frame of Douglas pine (*P. murrayana*), mountain maple (*Acer glabrum*), or mountain ash (*Pyrus americana*). Cross sticks of willow or birch, fine lacing of caribou babiche, foot lacing of moose-hide thong.

(2) Let'lu (stitched together). This is the voyageur and the typical Sioux snowshoe. Frame in two pieces, turned up in front, pointed at both ends, additional crosspieces used, and a line from the toe to the long crossbar. The frame is bent by wrapping strips of willow bark around it and heating, by cooking it in boiling water, or by pouring boiling water on it.

(3) Aih za (snowshoe only). Frame of two pieces, spliced, rounded and turned up in front; crossbars, two. In fact, it is the typical Athapascan shoe of the North, more commonly used than the others.

(4) Seskhe (black bear foot). Frame of a single hoop spliced at the heel, elliptical, crossbar inserted into a hole through either side. In this shoe the elements of weaving are reproduced with coarse thong in a clumsy manner.²

Father Morice asserts that the double-pointed snowshoe was little known among the Tacullies, or Carriers, until thirty or forty years ago.

¹ New York, 1895, xcu, pp. 10, 364.

² Morice, Trans. Canadian Inst., 1894, iv, pp. 152-155, figs. 141-145.

but they were worn by the Tsë'kèh ne from time immemorial. He also says that before Mackenzie (1793) snowshoes were unknown in the western Déné country, except among the Sekanais and Nah'anes.¹

From Point Barrow around to Bristol Bay, as has been seen, the Eskimo wears Indian snowshoes. The same is true of the Eastern Eskimo, as will be seen in the Turner collection.

Of the Cumberland Gulf Eskimo, Kumlien says that in traveling over the frozen wastes in winter they use snowshoes. These are half-moon-shaped, by which is meant that they are asymmetrical, or rights and lefts, and made of whalebone; that is, the bones of the whale, not baleen, with seal-thongs drawn tightly across. They are 16 inches long. Another pattern is merely a frame of wood, about the same length and 8 or 10 inches wide, with sealskin thongs for the feet to rest on.² This form associates itself with the rude types about Bering Strait.

Turner describes five varieties of snowshoes about Ungava, but reduces the forms to four: (1) Swallow tail, with tail or trailer; (2) beaver tail, kite shaped, with nipple-like projection behind; (3) round end kite shaped, without trailer; (4) single bar, frame oval, crossbar in front. The single bar specimens have also round end. Of these there are two varieties, that in which the crossbar comes in the middle of the foot and that in which it is in front of the toes (fig. 84).

In addition to these there comes from Little Whale River a snowshoe of spruce wood, No. 90145, U. S. National Museum (fig. 85). It is shaped like the single bar or round end pattern and looks as though it might have been cut out of a toboggan or flat sledge, common in all Canada. Two pieces of thin board are fitted together along their margins and sewed together with thong. Across them near the front and the rear a batten is sewed by a continuation of buttonhole stitches or half hitches. Just behind the front batten is the hole for giving free action and grip to the toes. In use the shoe is turned smooth side down and battens up. Turner says that this variety is used on soft

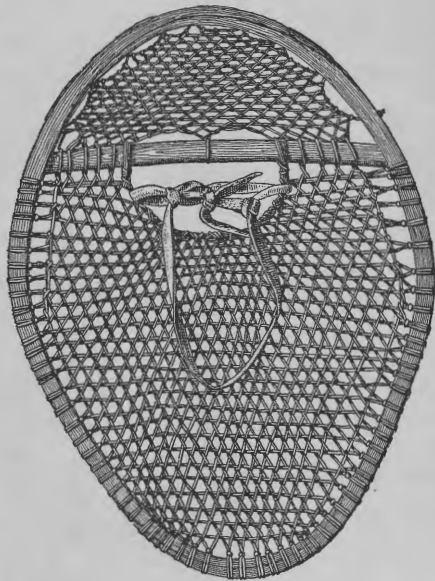


Fig. 84.

NETTED SNOWSHOE, SINGLE BAR, WORN BY THE NENENOT INDIANS, LABRADOR.

From a figure in the Eleventh Annual Report of the Bureau of Ethnology. Cat. No. 90023, U. S. N. M.

¹ Proc. Canadian Inst. (Series 3), VII, p. 131.

² Bull. U. S. Nat. Mus., No. 15, 1879, p. 42.

snow. In the spring the netted shoe becomes clogged. These may be made in a few hours, while the netted shoe requires several days of arduous labor.¹

The reader must look in the hyperborean region of the Old World for the skee or snowshoe made of boards.

Example No. 90151 is a pair of snowshoes from Ungava, Canada, collected by Lucien M. Turner (fig. 86). In the specimen here studied, two staves of pine, whittled into rectangular cross section, were spliced in front and bent into a kite shape, with somewhat square body and three rounded corners. At the fourth or hinder corner or heel the ends,

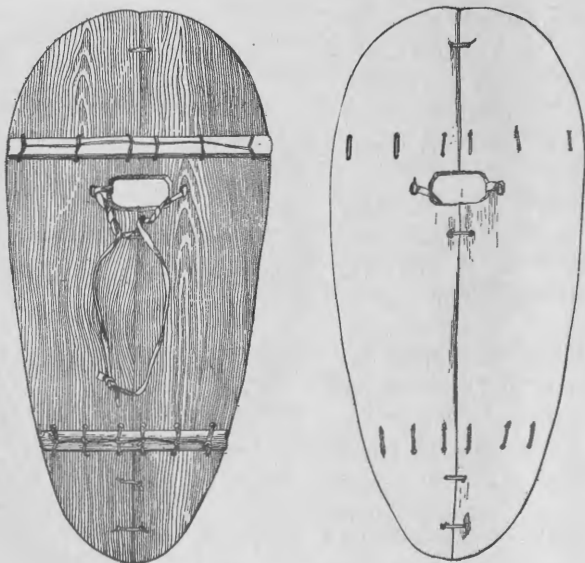


Fig. 85.

WOODEN SNOWSHOE WORN BY THE INDIANS OF LITTLE WHALE RIVER, LABRADOR.

From a figure in the Eleventh Annual Report of the Bureau of Ethnology.

Collected by L. M. Turner.

instead of being spliced, are pushed outward to form a tail, or trailer, and sewed together through countersunk holes. This framework is not of uniform thickness, but is thickest at the sides, somewhat smaller at the toe, and much thinner at the trailer. There are two crossbars mortised or let into the frame, flat oval in section and curved outward from the foot slightly. This specimen, like all others in Mr. Turner's collection, lies flat on the ground.²

¹ Eleventh Ann. Rep. Bureau of Ethnology, p. 312.

² For the detail, cf. Murdoch, Ninth Ann. Rep. Bureau of Ethnology.

The babiche netting of toe and heel is attached by regular hexagonal weaving to a border cord which is rove through the frame and obscured in countersunk cavities on the outside. Along the crossbars the toe and foot netting are laced into a border cord laid under the loops of the foot netting, excepting in front of the foot space where the border cord is rove through the crossbar. The netting of the foot space is woven hexagonally out of coarser babiche. Especially noteworthy is the tough band of hide forming the front border of this network, passing straight from either side of the frame to the foot space, where it is curved backward and held in form by stout bracings of hide. Under the toes it is sewed with babiche. On the right and left margins the network does not pass entirely outward to a border cord rove through the frame, but the bends make double loops about the frame at each excursion and are gathered into a straight selvage. This central web is also looped to the crossbars. The shoe is attached to the foot by a soft band of buckskin forming toe and heel loop.¹

Example No. 90149 (fig. 87) is a pair of snowshoes collected in Ungava, north of Labrador, by Lucien Turner. In most particular this specimen resembles that last described, excepting that the width is still more disproportionate to the length and near the heel the frame on either side bends

outward and then sharply inward, forming a tongue-shaped end, and quite aptly called a beaver tail. Many of the long, slender Athapascan shoes reverse the process and near the heel begin suddenly to narrow. In this example the shoe is made of two pieces of wood in form of a loop or oxbow spliced together on the sides of the foot space, the hinder bow laid inside the forward bow precisely as in the Aino specimen. The spliced portions are held in position by the loops of the

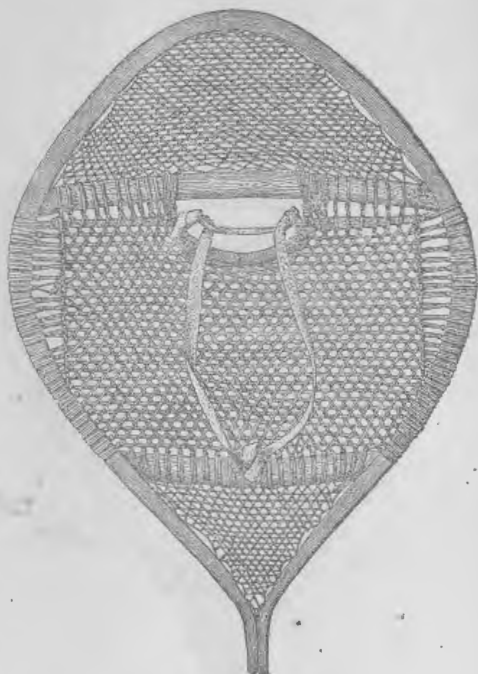


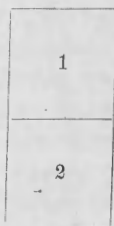
Fig. 86.

NETTED SNOWSHOE, SWALLOW TAIL PATTERN, WORN BY THE NENENOT INDIANS, LABRADOR.

From a figure in the Eleventh Annual Report of the Bureau of Ethnology.
Cat. No. 90151, U. S. N. M. Collected by L. M. Turner.

¹ Turner, Eleventh Ann. Rep. Bureau of Ethnology, pl. xi.

EXPLANATION OF PLATE 17.



NETTED SNOWSHOES.

Fig. 1. MODERN ELLIPTICAL FORM USED BY HUNTERS IN THE ADIRONDACKS.

Broad, short type. The frame is of one piece of squared and tapered wood, bent. It is spliced and lashed with rawhide at the heel, perfectly flat, slightly oval, and has two broad crossbars let into the frame. There are no perforations in the frame, but eight holes are bored through the front crossbar for the twisted thongs that support the footing. The foot space occupies nearly all the interior, the front and the rear space being insignificant.

The netting is of tough rawhide in hexagonal weaving, the thong being fastened at each round by a loose knot or double half hitch around the frame, crossbar, or footing. The thong is rove through the front crosspiece, and twined between it and the footing. The shoe is fastened on with buckled bands and straps. Collection of Maj. Charles Bendire, U. S. A.

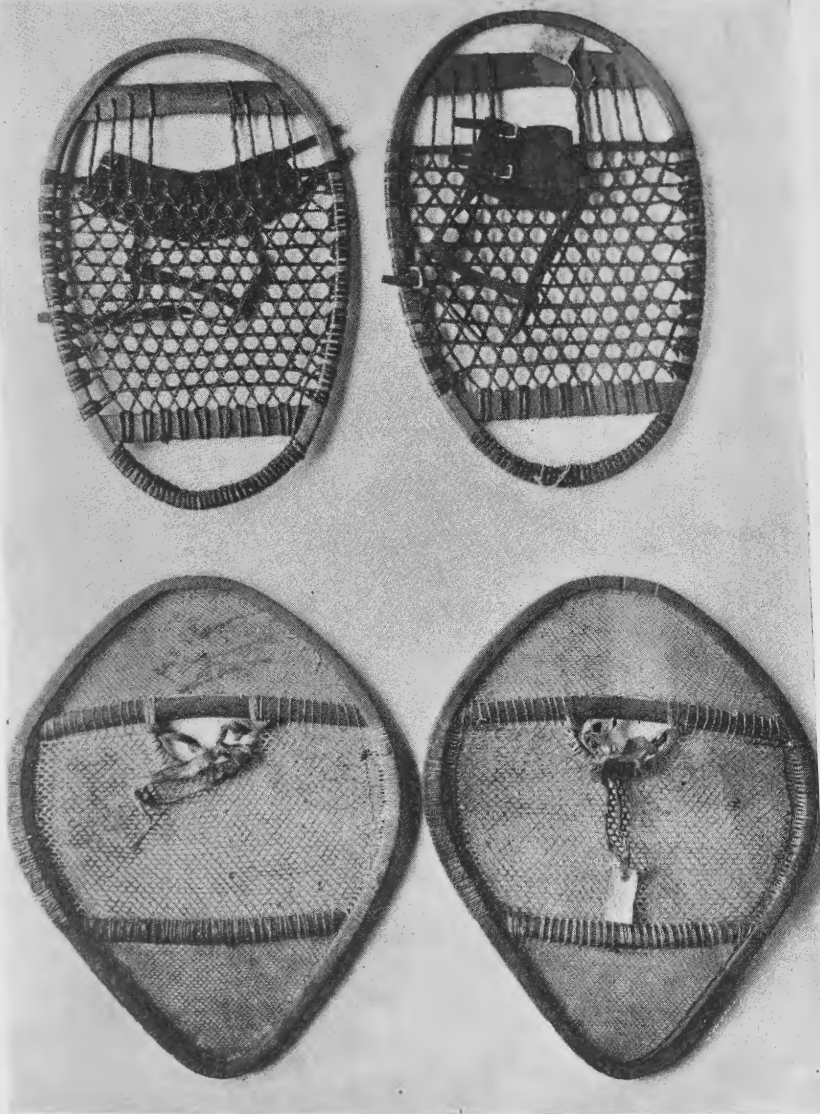
(Cat. No. 126839, U. S. N. M.)

Fig. 2. NETTED SNOWSHOE OF ALGONQUIAN INDIANS OF NORTHERN LABRADOR

AND UNGAVA. Broad, oval type. The frame is of one piece of squared and tapered wood, bent, spliced, and lashed together at the side, perfectly flat, oval or kite shaped, having two stout, curved crossbars let into the frame. The curves are set to take the strain of the foot netting. There are V-shaped perforations in the frame around the front and rear spaces, and three holes are bored through the front crosspiece over against the footing.

The lacing is of very fine babiche or deerskin thong, woven in hexagonal pattern over a selvage thong, knotted into the V-shaped holes continuously about the frame, and caught under the foot-space loops along the crosspieces. The netting of the central space is caught around the frame and crossbars by double half hitches, as in the foregoing specimen, but also neatly looped about the footing thong. This example is fastened to the foot by a soft buckskin thong. Collected by Lucien M. Turner.

(Cat. No. 90147, U. S. N. M.)



NETTED SNOWSHOES.

parchment condition to be purchased by the mountaineers, who cut them into fine lines for snowshoe netting and other purposes.¹

Mr. Henry G. Bryant, of the University of Pennsylvania, brought from the interior of Labrador a pair of Montagnais snowshoes almost circular, conforming to the pattern of those figured by Turner. There are two strong braces and a short trailer.

In this same connection should be introduced a modern snowshoe, example No. 126839 (pl. 17, figs. 1 and 2), collected in the Adirondacks by Major C. E. Bendire, U. S. A. The frame is of hard wood, probably oak, bent into oval form, a little wider in front, and spliced at the heel by a series of half hitches.

It lies flat on the ground, as in the Nenenot examples from Ungava. The crossbars are very near the toe and the heel, and there is no attempt at netting. The netting of the foot space is of the best rawhide laid on by hexagonal weaving, as in all the other specimens from Canada. The netting is not worked about the space for the toes, but the stout thong of the foot-rest passes straight across and is sustained by continuing the diagonal filaments of the network and reeving them through the crossbar. At the heel they form double loops about the crossbar, and at the side the fastening is by half hitches. The foot is held in place by a leather band with buckles, an adjustable strap passing around the heel. The principle of attachment is the same everywhere.

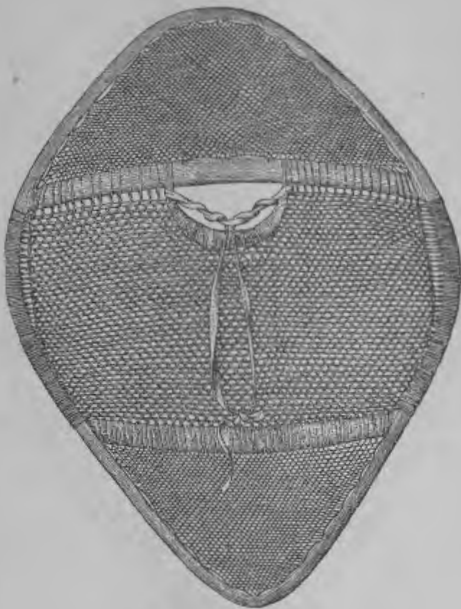


Fig. 88.

NETTED SNOWSHOE, ROUND END, WORN BY THE NENENOT INDIANS, LABRADOR.

From a figure in the Eleventh Annual Report of the Bureau of Ethnology.
Cat. No. 90147, U. S. N. M.

According to Lewis H. Morgan, the Iroquois wore a wide snowshoe, as will appear in the following description:

The snowshoe, *ga-weh-ga*, is nearly 3 feet in length by about 16 inches in width. A rim of hickory, bent round with an arching front, and brought to a point at the heel, constituted the frame, with the addition of crosspieces to determine its spread. Within the area, with the exception of an opening for the toe, was woven a network of deer-skin strings, with interstices about an inch square. The ball of the

¹ Turner, Eleventh Ann. Rep. Bureau of Ethnology, p. 181.

foot was lashed at the edge of this opening with thongs which passed also around the heel for the support of the foot. The heel was left free to work up and down, and the opening was designed to allow the toes of the foot to descend below the surface of the shoe, as the heel is raised in the act of walking. It is a very simple invention, but exactly adapted for its uses. A person familiar with the snowshoe can walk as rapidly with it on the snow as without it upon the ground. The Senecas affirm that they can walk 50 miles per day upon snowshoes, and with much greater rapidity than without them, in consequence of the length and uniformity of the step. In the bear hunt, especially, it is of the greatest

service, as the hunter can speedily overtake the bear, who, breaking through the crust, is enabled to move but slowly.¹

Examples Nos. 24788 (pl. 18) and 24789 are modern snowshoes used by hunters and trappers of St. Lawrence Valley and manufactured by Renfrew & Co., of Quebec. The frame is made of a single stave of hickory, rectangular in cross section. The two braces are of beech or oak. In form the shoe is elongated, kite-shaped, with a trailer 9 inches long. It is broad across the middle, bluntly rounded at the toe, and slightly curved up. The netting is said to be of the stripped and untwisted sinew of the Caribou (*Rangifer tarandus*). The foot netting is looped about the

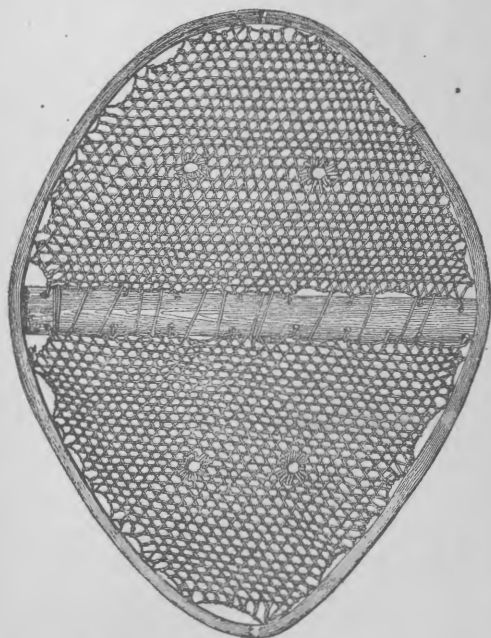


Fig. 89.

NETTED SNOWSHOE WITH CENTRAL BAR, WORN BY THE NENE
NOT INDIANS, LABRADOR.

From a figure in the Eleventh Annual Report of the Bureau of Ethnology
Cat. No. 90022, U. S. N. M.

frame at the sides and passes about the braces by single turns. At the distance of an inch or more from the framework there is a selvage where the weaving commences, and outside of this the filaments are twined and act as a series of slings. The same is true of the toe and heel netting. There is first a border cord rove through a series of double holes in the frame, countersunk on the outside, but not so well concealed as in the old voyageur specimen. This border cord passes along the outer margin of the crossbars, between the wood and the loops of the foot netting. Indeed, both sets of network hang on this

¹ Lewis H. Morgan, "League of the Iroquois," 1851, pp. 376-377.

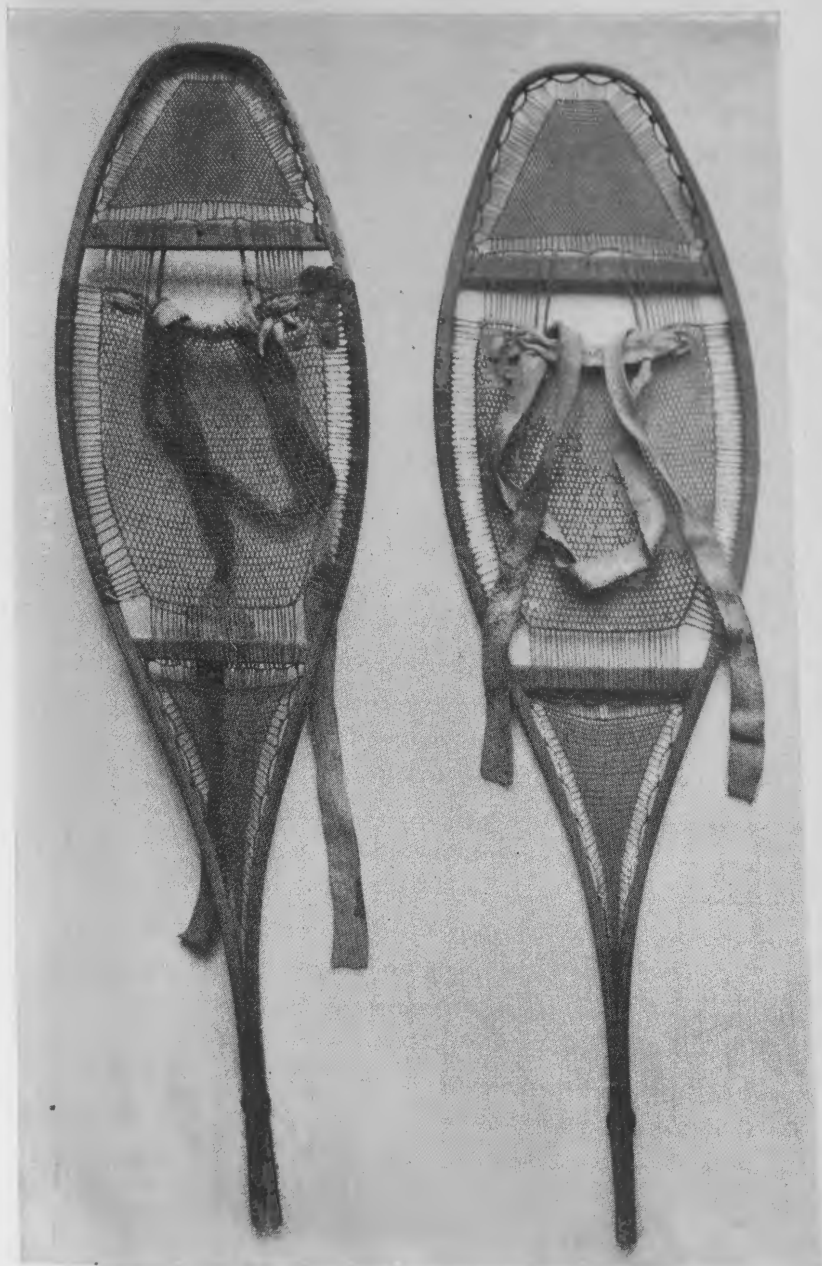
EXPLANATION OF PLATE 18.

MODERN CLUB SNOWSHOES FROM MONTREAL.

The frame is of one piece of squared and tapered wood, bent at the toe, and united at the heel by a thong rove through two perforations, quite flat, abruptly rounded at the toe, with two crossbars let into the frame. The perforations in the frame are V-shaped, but in the front crossbar three holes are bored for the netting thong or selvage.

The netting is of fine rawhide thong, woven hexagonally about the knotted thong or about the framework. The netting does not in any one of the spaces reach the woodwork, but at the end of each excursion the filament is twisted a definite number of times. The edge of the woven space is afterwards whipped around with a separate thong. This makes a neat and pretty ornament. Gift of Renfrew and Company, manufacturers.

(Cat. No. 24788, U. S. N. M.)



MODERN CLUB SNOWSHOES.
Montreal, Canada.

EXPLANATION OF PLATE 19.

NETTED SNOWSHOES.

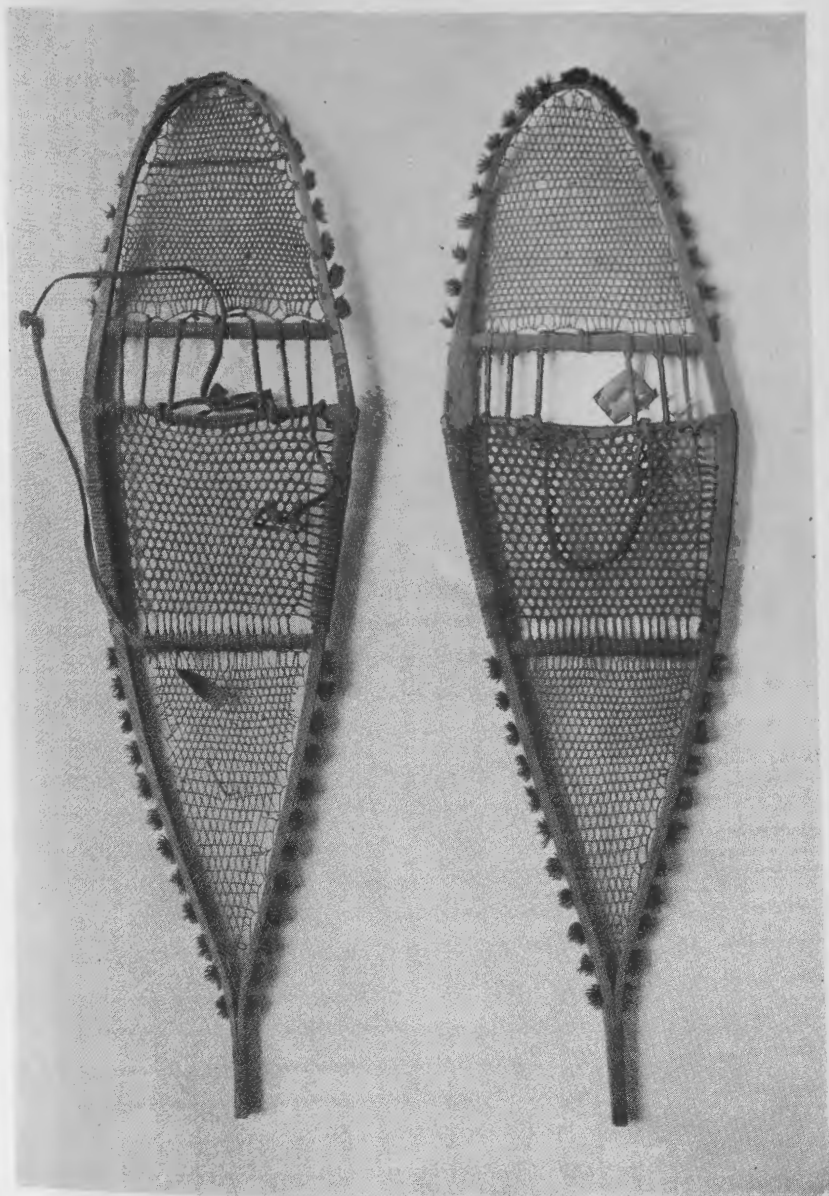
This is an old pair found in the Varden collection, United States Patent Office. The frame is of one piece of squared and tapered wood, bent, and joined at the heel, forming a short trailer. It is quite flat, and is provided with two crosspieces let into the frame. The perforations in the frame for the selvage thong of the netting, are V-shaped, and, as in all the other examples, they meet a little way within the outer side of the frame, so that the bend in the thong is countersunk or concealed. There are no holes at all about the central space, hence this was a very strong shoe.

The netting is all of buckskin thong, thicker in the foot space. The weaving is done immediately through the selvage thong about the frames, but it is twisted and looped around an additional thong athwart the crosspieces. On the hinder bar this added thong is caught under the double ends of the central space weaving, and furthermore is held in place by an extra winding of thong.

The netting of the central space is looped about the frame and crossbars by a curious knot, consisting of a half hitch, and a plain wrap instead of the conventional loop knot. (See plate 18, fig. 1, rear crossbar.) The cross thongs that form the footing are swung to the front crossbar by six stout thongs, doubled twice, and neatly wrapped with the same. Instead of perforations in the front crossbar, a stout thong is wrapped about the middle, to hold the front netting and prevent abrasion by the moccasin.

Canada. Collected by J. Varden.

(Cat. Nos. 1755, 1756, U. S. N. M.)



NETTED SNOWSHOES.
Canada.

cord. At the ends of the crossbars and in the middle of the front bar the cord is rove through and knotted with a single tie.

The footband is a broad strap of soft buckskin, under which the toe of the moccasin passes. The ends of this band pass through eyelets worked in the netting and then are laced about the heel and ankle. These eyelets appear on one of Turner's single-bar snowshoes from Ungava. Length, 42 inches; width, $12\frac{1}{2}$ inches. Other examples of this type in the National Museum are Nos. 1755 and 1756 in the collection of the National Institute, and No. 18826 from the St. Regis Iroquois Reservation, New York (pl. 19).

The Cree Indians around Winnipeg, on the authority of Dr. E. R. Young, have two or three pairs of snowshoes each. They are of the turned-up and pointed variety, formed of two pieces. One pair is made just the height of the man. These are for long journeys after deer, etc. The hunter will carry in his hand a long pole, to the end of which is lashed his hunting knife, and when he runs down the game he soon dispatches it with his extemporized lance. Another pair of snowshoes is used for home hunting, and the third pair around his home. The women do not wear a different shoe from the men. The shoes are rights and lefts.

Example No. 73308 in the National Museum, in the Catlin collection, is of the same type.

Two of the oldest and most interesting specimens of snowshoes in the National Museum from the Algonquian are Nos. 1755 and 1756, above-mentioned. The frame is rectangular in the cross sections, and consists of a single piece, smallest at the toe, widening and thickening toward the foot rest, and tapering again toward the trail. There are three crossbars, one small one in front and two rounded sticks bordering the foot space. The netting of the toe and heel space is in hexagonal weaving attached all round by a series of loops rove through the frame on the sides and caught under the lashing of the foot space along the crossbars. This weaving is made of very finely cut deerskin (or babiche) woven with great care. The netting of the foot space is of coarser babiche, and passes around the crosspieces and the frame on the outside. The hexagonal weaving and the strong rawhide piece on which the ball of the foot rests are all swung from the frame by a twine an inch long on the sides, and in front 3 inches long, the front lines being also wrapped or marled with rawhide. The knots by which the foot netting is attached to the frame on the sides are called the clove hitch, and along the front foot bar the knots are fastened off with half hitches. The small line to which the front netting is attached, and also the cross line which forms the sling of the foot netting, in passing from one knot to another is fastened down with what sailors call the marline hitch. Around the border of the foot netting—in order to strengthen it—there is an additional twining or wrapping of babiche to keep the meshes in place.

Examples Nos. 19116 to 19119 are modern snowshoes made in Marquette, Mich., and given to the National Museum by T. Meads. A pair

of these is shown in pl. 20. They represent the western Canadian idea of perfection as the Renfrew examples do the eastern. The frame is rectangular, flat, squared in front and cut a little thicker in the middle of the front. They are wide in the middle, taper more abruptly than the eastern specimens and have not such long trailers. Furthermore, the babiche is finer and the netting goes snug up to the frame everywhere excepting the front and hinder margin of the foot net. The square-toed snowshoe is geographically located south of the double-pointed voyageur type and west of the flat, round front type. It is the snowshoe of the Western lakes. Examples in the Museum are Nos. 73307-73310, Catlin collection, possibly Chippewa No. 2651 from the War Department, no tribe given; and Nos. 154369-154371 collected among the Menimonee by Dr. W. J. Hoffman.

In Glen Island Museum of Natural History, New York, are exhibited Nick Stoner's snowshoes, of the double-pointed type. They are square in cross section, turned up in front, the two pieces riveted together with iron. There are two crossbars, no toe and heel netting, and the rawhide lacing is wrapped around frame and crosspieces.

Again and again it was said, when studying the Mackenzie River snowshoe, that the voyageurs and white agents of the Hudson Bay, while they walked on the round-ended shoe, preferred these sharp at the ends for tripping. In Catlin's pictures (Smithsonian Report 1883, II, pl. 99), this pointed shoe occurs with Siouan label. Indeed, this variety may be called temporarily the Siouan type (fig. 90). It is an exalted form of the Chukchi type,

consisting in this case of the outer frame

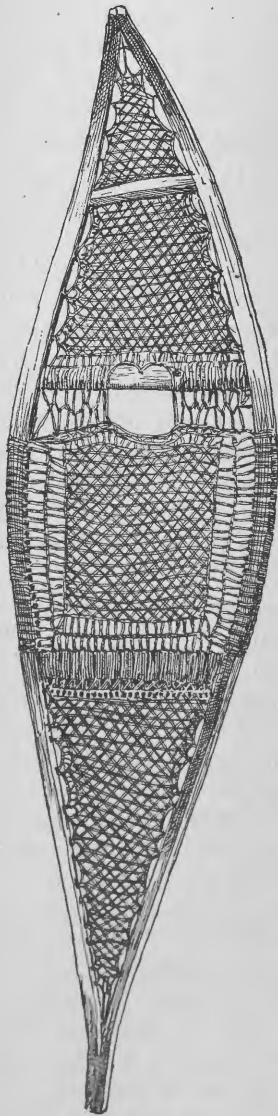


Fig. 90.

NETTED SNOWSHOE, POINTED AT BOTH ENDS, PROBABLY SIOUX.

Cat. No. 2730, U. S. N. M. Collected by the War Department.

of two pieces square in cross section, irregularly lenticular in outline and turned up at both ends and resembles that of the Tsekehne.

EXPLANATION OF PLATE 20.

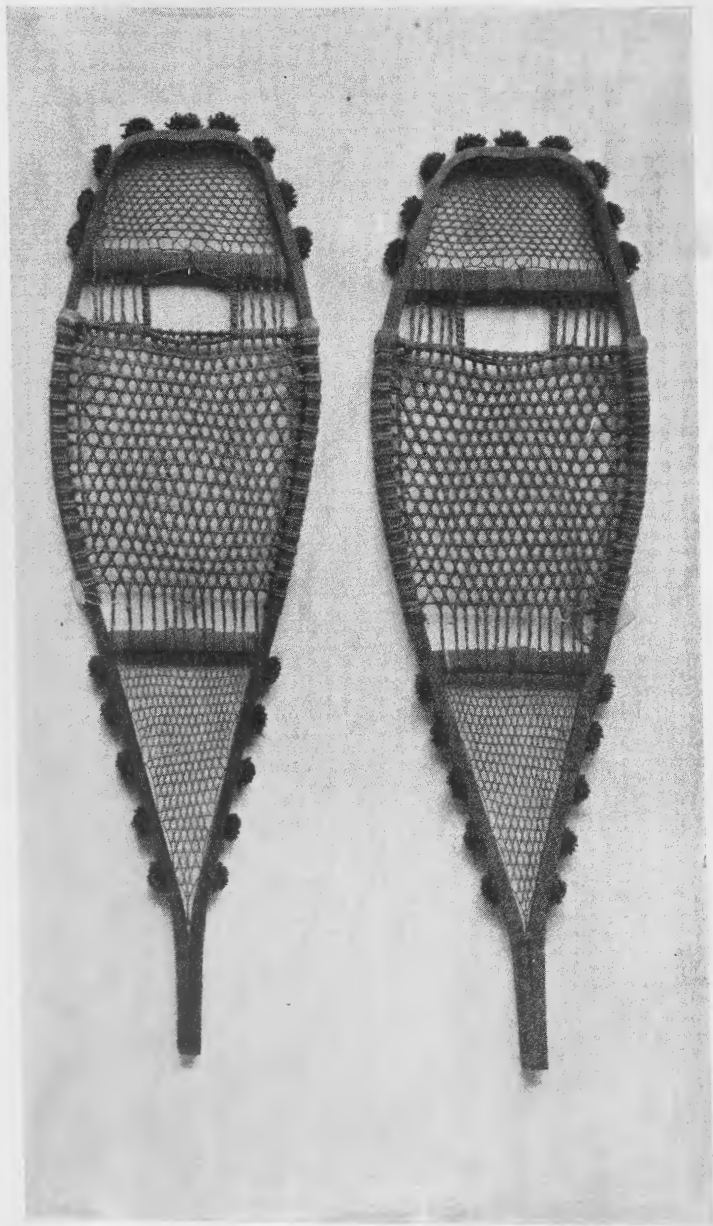
MODERN NETTED SNOWSHOES.

The frame is of one piece of squared and tapered wood, cut in ogee curve on the inside of the toe. It is bent almost square in front, and joined together at the heel with a short trailer; flat, somewhat short and broad, and having two crossbars set well front and back. The front and rear netting is very light, and is attached to the knotted selvage thong in the usual way. The ingenuity of the maker has exhausted itself on the long central space. The noteworthy features are:

- (1) The hexagonal weaving in stout thong.
- (2) The double loop knots about the frame.
- (3) The single loops about the crosspieces, inclosing at the same time the selvage thong of the front and rear netting, and the long twisted ends that form these loops.
- (4) The quadruple cross thong for the footing.
- (5) The neat slings holding the footing to the front crossbar.
- (6) The absence of holes in the wood anywhere about the middle space.

The ornamentation on the outside is formed by tufts of different-colored yarns, caught under the knots in the selvage thong where it is tied through the frame. Grand Rapids, Mich. Gift of Mead and Company, manufacturers.

(Cat. Nos. 19116-19119, U. S. N. M.)



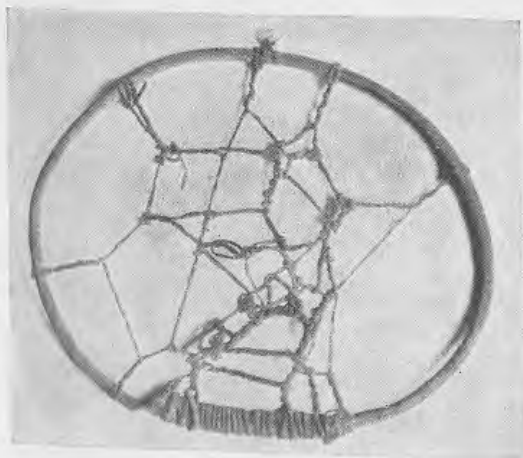
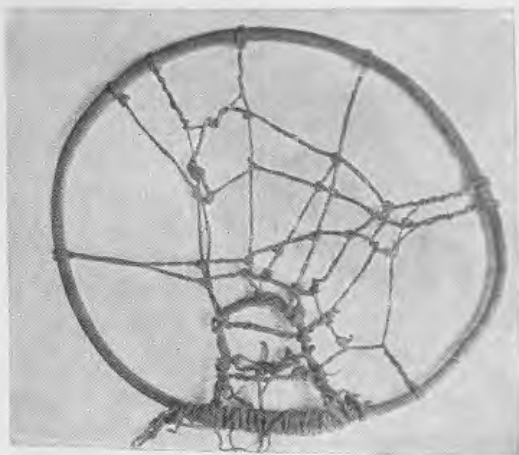
MODERN NETTED SNOWSHOES.
Grand Rapids, Michigan.

EXPLANATION OF PLATE 21.

RUDE SNOWSHOES.

These are old specimens from the western territories. The frames, the breadth of which is greater than the length, are made of rough poles, skinned, spliced, and clumsily wrapped at the front. There are no crosspieces nor perforations. The entire interior is like the central space of the Alaskan ruder forms, and must be so studied. The foot rest is at the front, made by doubling and twisting the thong. It is quite possible that long handling may have disturbed the radiating thong. The twist, which is so beautifully handled in better specimens, is here in embryo. The curious loop of single turn and half hitch may be noted. Mr. Eells describes in the "American Antiquarian" (vol. x) precisely this form of snowshoe among the Salishan tribes from Puget Sound eastward. Snowshoes are also reported from the cliff-dwellings of the Mesa Verde. Collected by the War Department.

(Cat. No. 2729, U. S. N. M.)



RUDE SNOWSHOES.

No example of snowshoe is in the National Museum from the Indians of Alaska, Canada, or the eastern United States that was not made with metal tools. No remains of an ancient and purely Indian type have been recovered. Therefore, with the utmost caution, the skill of the tribes long associated with French and English as trappers, should be set over against that of others whose snowshoes were ruder. The very fine babiche is the production of the curved steel knife, and the refinement of the snowshoe seems to date from its introduction.

In the western slopes of the Rocky Mountain region, and thence over the Sierras to the Pacific Ocean, will be found the most primitive types of American Indian snowshoes, and yet the Renfrew, the Turner, and the Meads examples are illuminated by these rude specimens. Example No. 2729 (pl. 21) in the National Museum is a pair of snowshoes collected among the Utes, of Utah, in 1841, by Capt. H. Stansbury, during the

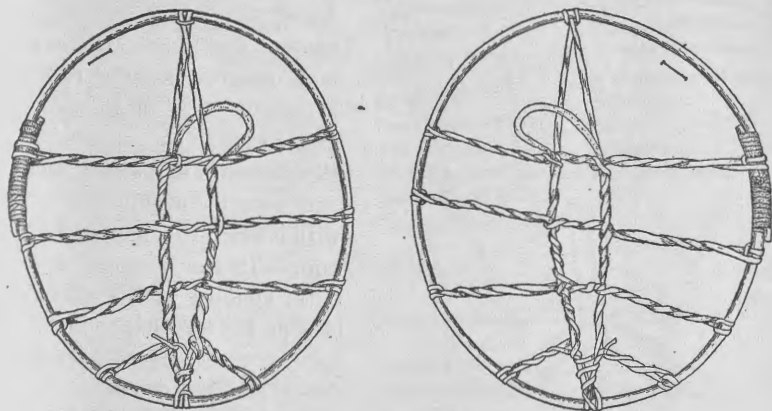


Fig. 91.

PRIMITIVE SNOWSHOE, WORN BY THE KLAMATH (LUTUAMIAN) INDIANS OF CALIFORNIA.

Cat. No. 24109, U. S. N. M. Collected by L. S. Dyar.

Rocky Mountain exploring expedition. The frame is a bent pole, the hoop being wider than long, the ends roughly spliced and lashed with rawhide in front. There are no crossbars, but an intimation of structure in the position of the foot rest. The two elements of the perfected snowshoe, here exhibited in their nakedness, are the double loop about the frame, as in figure 82, and the twined thong acting as a set of slings for footing. The network is a series of half hitches made by the thong wherever it crosses itself. The two shoes are not even alike. Length, $16\frac{1}{2}$ inches; width, 20.

Example No. 24109 (fig. 91) is a pair of snowshoes collected on the Klamath River Agency, Oreg., by L. S. Dyar, Indian agent. The framework is a hoop made of a pole and is lashed together at the side with buckskin, with very little splicing. The network is all of one piece of rawhide passed backward and forward, commencing at the

lower right-hand corner and fastened to the hoop, not by a double loop, but by a half hitch and single turn and then twined about the standing part. Diameter, 14 inches.

To complete the western series is example No. 2728 (fig. 92), a very old

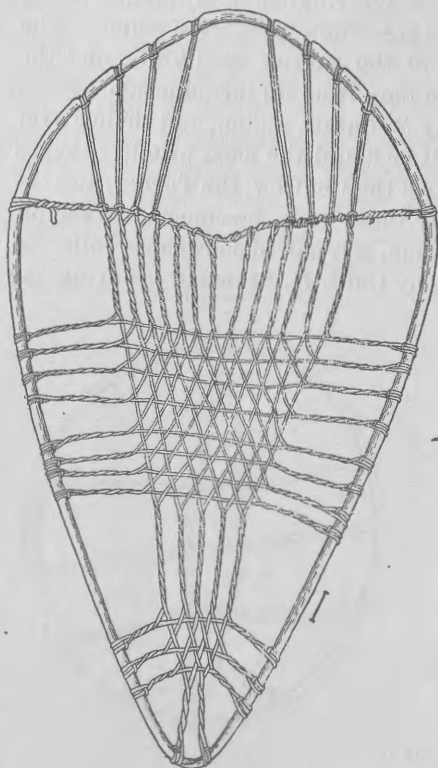


Fig. 92.

PRIMITIVE TYPE OF SNOWSHOE FROM COLUMBIA RIVER,
WASHINGTON.

Cat. No. 2728, U. S. N. M. Collected by Wilkes Exploring Expedition.

Mr. F. W. Hodge says that the Zuñi and other pueblo tribes make an overshoe of goatskin, worn over the moccasin in the snow, with the hair side out. Snowshoes are also reported in the cliff-dwellings.

SNOWSHOES IN THE U. S. NATIONAL MUSEUM.

Museum number.	Specimen.	Locality.	By whom contributed.
167891, 167892	Skees	Finland	Hon. J. M. Crawford.
169274	.....do.....	Minnesota	Theo. Roosevelt.
22195	Snowshoes, Ainos (p. 386).....	Japan	Hon. R. S. Lyman.
22196	Snowshoes (fig. 76).....	Yokohama, Japan	Do.
150843	Snowshoes (p. 386).....	Yezo, Japan	Romya Hitchcock.
63602, 63603	Snowshoes (p. 389).....	Siberia	E. W. Nelson.
63604	Snowshoes (fig. 79).....	Icy Cape	Do.

SNOWSHOES IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
2442	Snowshoes (fig. 78).....	Chukchi.....	Commodore Rodgers.
2443	.....do.....	.....do.....	Do.
15605	Snowshoes (p. 389).....	St. Lawrence Island, Alaska.	H. W. Elliott.
45732, 45733	.....do.....	.....do.....	Capt. C. L. Hooper.
63236	Snowshoes (p. 389).....	.....do.....	E. W. Nelson.
44265	Snowshoes, toy.....	Cape Darby, Alaska.....	Do.
48092	Snowshoes (fig. 80).....	.....do.....	Do.
45400	Snowshoes (pl. 11).....	Norton Bay, Alaska.....	Do.
48103	Snowshoes (p. 390).....	.....do.....	Do.
896	Snowshoes, Kutchin Indians (p. 397)	Alaska.....	C. P. Gaudet.
5569	Snowshoes (pl. 12).....	Yukon River, Alaska.....	W. H. Dall.
49099	Snowshoes (p. 391).....	.....do.....	E. W. Nelson.
8812	Snowshoes, Ingaliuk Eskimo (p. 391)	.....do.....	W. H. Dall.
38873	Snowshoes (p. 391).....	.....do.....	Do.
90455	Snowshoes, Kenai Indians.....	Cooks Inlet.....	W. J. Fisher.
90456	.....do.....	.....do.....	Do.
38874	Snowshoes (p. 394).....	Alaska.....	E. W. Nelson.
72420, 72421	Snowshoes (pl. 13).....	Bristol Bay, Alaska.....	C. L. McKay.
89912-89914	Snowshoes (fig. 81).....	Point Barrow, Alaska.....	Lieut. P. H. Ray.
877	Snowshoes (p. 397).....	Anderson River.....	R. Kennicott.
571	Snowshoes, Kootcha, Kutchin.....	Northwest Canada.....	W. L. Hardisty.
862	Snowshoes.....	Yukon River, Alaska.....	R. Kennicott.
127941	Snowshoes (p. 391).....	Putnam River, Alaska.....	Lieut. G. M. Stoney, U. S. N.
127614	Snowshoes, Tinnei Indians (p. 395)	Alaska.....	Lieut. E. B. Webster, U. S. N.
153488	.....do.....	Upper Yukon, Alaska.....	J. C. Russell.
153489	.....do.....	.....do.....	Do.
153651, 153652	Snowshoes.....	Yukon River, Alaska.....	J. H. Turner.
7470	Snowshoes (p. 397).....	Fort Anderson, Canada.....	R. MacFarlane.
7471	Snowshoes (p. 397).....	.....do.....	Do.
530	Snowshoes, Chippewayan.....	Mackenzie River, Canada.....	B. R. Ross.
1974	Snowshoes (p. 395).....	.....do.....	Do.
1975	Snowshoes (p. 396).....	.....do.....	Do.
2046	Snowshoes (p. 395).....	.....do.....	Do.
528	Babiche or snowshoe line.....	.....do.....	Do.
568	Snowshoes, Slave Indians.....	.....do.....	Do.
569	Snowshoes, Chippewayan Indians.....	.....do.....	Do.
2044	Babiche for snowshoes.....	Fort Simpson, Canada.....	Do.
5647	Snowshoes (pl. 16).....	.....do.....	Do.
860	Snowshoes of voyagers, for walking behind dog sledge (p. 395)	Mackenzie River, Canada.....	R. Kennicott.
861	Snowshoes, Slave Indians (p. 395)	.....do.....	Do.
5646	Snowshoes, Slave Indians (p. 395)	.....do.....	Do.
536	Snowshoes, Yellow Knife Indians.....	.....do.....	Do.
2045	Snowshoes, Yellow Knife Indians (p. 395)	.....do.....	Do.
1330	Snowshoes (p. 397).....	.....do.....	C. P. Gaudet.
72462	.....do.....	Chilkat, Alaska.....	John J. McLean.
20783	Snowshoes (pl. 15).....	Sitka, Alaska.....	J. G. Swan.
63558	Snowshoes (pl. 14).....	.....do.....	John J. McLean.
153509	Snowshoes, Montagnais.....	Labrador.....	Henry G. Bryant.
90019, 90029	Snowshoes, small.....	Ungava Bay, Labrador.....	L. M. Turner.

SNOWSHOES IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
90023	Snowshoes (fig. 84).....	Ungava Bay, Labrador..	L. M. Turner.
90145	Snowshoes (p. 402).....	do	Do.
90146-90153	Snowshoes (figs. 86-88, pl. 17).....	do	Do.
2651	Snowshoes, Chippewa (p. 406).....	Wisconsin.....	War Department.
154370	Snowshoes, Ojibwa.....	Minnesota.....	W. J. Hoffman.
154371	Snowshoes, girl's.....	do	Do.
19116-19118	Snowshoes (pl. 20).....	Marquette, Mich.....	T. Meads.
19119	Snowshoes, small model (p. 406).....	do	Do.
154369	Snowshoes (p. 406.).....	Menominee, Wis.....	W. J. Hoffman.
126839	Snowshoes, hunter's (p. 403).....	Adirondacks	Maj. C. E. Bendire, U. S. A.
24788, 24789	Snowshoes (pl. 18).....	British North America..	G. R. Renfrew & Co.
1755	Snowshoes (pl. 19).....	Eastern part of British North America.	J. Varden.
1756	Snowshoes (p. 405).....	do	Do.
2730	Snowshoes, Sioux Indians (fig. 90).....	do	War Department.
73307-73310	Snowshoes, Catlin collection (p. 406).....	do	do
2728	Snowshoes, Indians of the North- west Coast of America (fig. 92).	do	Captain Wilkes, U. S. N.
24109	Snowshoes, circular (fig. 91).....	Klamath.....	L. S. Dyar.
2729	Snowshoes, Coast Indians (pl. 20).....	Columbia River	Lieut. Wilkes, U. S. N.
165588	Snowshoes.....	Klamath, Cal.....	A. S. Gatschet.

ICE CREEPERS.

The ice creeper is a device of some kind worn under the boot in winter to enable the traveler to walk over smooth ice or snow crust without slipping. The snowshoe prevents the traveler from sinking in the snow and at the same time in many places, especially in America and north-eastern Asia, affords a ratchet to prevent the foot from slipping backward. The creeper, however, does not prevent the foot from sinking in the snow, but simply acts as a ratchet or stop to prevent its slipping in any direction. This result is achieved in different ways by different peoples. The Russians, the Chinese, and the Mongols attach sharp-headed nails, sometimes of immense size, to the bottoms of their boots. The eastern Eskimo quilt the bottom of the shoe, leaving loops of rawhide projecting underneath which serve the purpose, but the ice creeper (par excellence) is a device fastened under the shoe and not a part of it, provided with sharp points beneath, which keep the foot from slipping.

There is a small area of distribution for this type of objects, as exhibited by the collection in the U. S. National Museum, partly in north-eastern Asia and partly in northwestern America. It is a question, not yet settled, whether both sets of peoples owe the existence of this invention to the presence of the Russians in that quarter.

In America ice creepers precisely like those of the Eskimo, Chukchi, and Kamchadales, made, however, of leather and iron, are worn extensively in winter throughout the Northern States.

The U. S. National Museum does not possess any specimens from Russia, but doubtless such things are used there abundantly.

The Roman soldier at times wore under the bottom of his caliga or sandal sharp spikes, like harrow teeth, so that if literally men were not mangled under harrows, it was just as painful to be tramped to death thus. Greig reproduces one of these sandals from Balduinus de Calceo Antiquo, etc.¹

Example No. 55850 is a mandarin's boot from north China to be worn in icy weather. The legs and uppers are of soft, black leather lined with blue cotton. The front seam extends from the sole in front to the top of the leg. The back seam, as in our boots, reaches from the sole to the top, and in both seams is a neat piping of thin leather. The noticeable feature here is the existence of a thick extra sole and heel, the former having sixteen rifle-bullet shaped iron points, the latter twelve projecting downward half an inch, as though two Kamchatkan ice-creeper frames had been nailed beneath each boot.

The Aino rode on broad Amur-skees drawn by the reindeer. Nordenskiöld figures, from an old Japanese book, an Aino man, bare-headed, dressed in fur, wearing skin boots, standing on a pair of skees and holding the staff or balancing pole in his hand. In front of the man trots a reindeer having a rawhide line about its neck, the other end of which is tied around the man's waist.²

Example No. 73092 (fig. 93) is a snowshoe frame and ice creeper combined. The framework consists of two bent sticks in shape of an oxbow, one telescoped into the other and bound with spruce root tucked in at the ends. Secured between the two bows, at the side, are wedge-shaped pieces sharp at the bottom so as to be driven into the snow crust, or surface, or rough ice. The structure of this specimen is the same as that of the snowshoe before mentioned from the Caucasus.

The Kamchatkans use in hunting the ice shoe, consisting of two small parallel "splines" 3 feet long and 7 to 8 inches apart, united at each end, and having crossbars; they have the same curve at each end, and are arched in the middle the same as snowshoes, and like them fastened on with straps. The splines are set underneath with pointed bones to stick into the ice. This example may be compared with the Finland

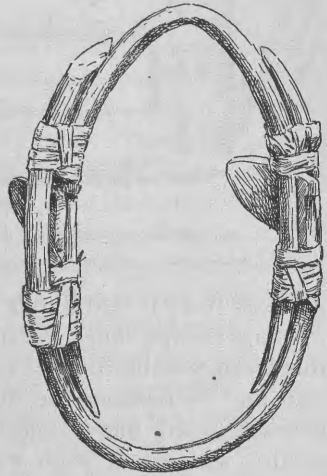


Fig. 93.

COMBINED SNOWSHOE AND ICE CREEPER
WORN BY THE AINOS OF JAPAN.

Cat. No. 73092, U. S. N. M. Collected by Romya
Hitchcock.

¹T. W. Greig, "Old-Fashioned Shoes," pl. xvi.

²"Voyage of the Vega," New York, 1882, p. 475.

skee, which has a midrib or keel the whole length underneath. The Kamchadal who live in the neighborhood of ice hills or glaciers make use of sharp-pointed irons, called posluki,¹ which they fasten to the foot.

"For smooth ice or snow the Tuski use 'creepers' of carved ivory, having serrated edges, fastened under the moccasin, which prove of great service."²

Example No. 2433 (fig. 94) is an ice creeper from northeastern Asia col-

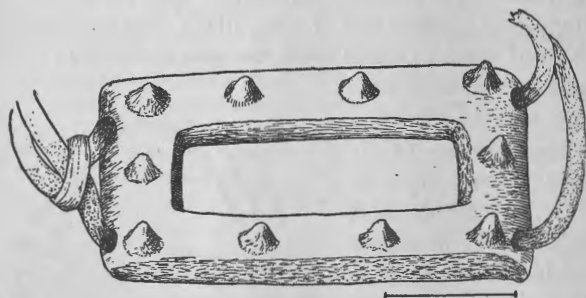


Fig. 94.

ICE CREEPER OF IVORY FROM NORTHEASTERN SIBERIA.

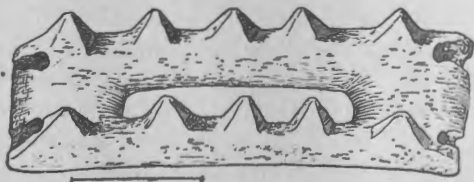
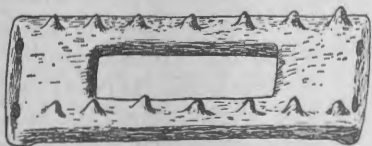
Cat. No. 2433, U. S. N. M. Collected by the Rodgers Expedition.

lected by Admiral John Rodgers. It consists of a piece of walrus ivory cut in rectangular shape and having a rectangular piece removed from the middle. Around the underside of the remaining piece are ten projections or blunt points. This

piece of ivory is tied under the instep of the boot by means of a thong passing through holes bored at either end. The student in looking at this piece will hardly fail to recognize that it is copied from something else, and in reading the description of the wooden frame with spikes beneath, worn under foot by Kamchadal, will see at once whence the motive came.

Example No. 46261 (fig. 95) is an ice creeper from Plover Bay, in north-eastern Asia, collected by W. M.

Noyes. It is well known that the people of Plover Bay are Eskimo who have gone over there in times not remote to take up their abode, and this specimen, therefore, was worn by an Eskimo. It consists of an oblong, rectangular piece of ivory cut out in the middle and having four-



Figs. 95 and 96.

ICE CREEPERS OF IVORY FROM PLOVER BAY, SIBERIA.

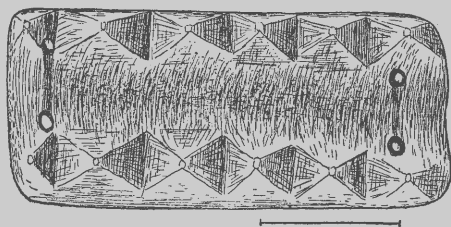
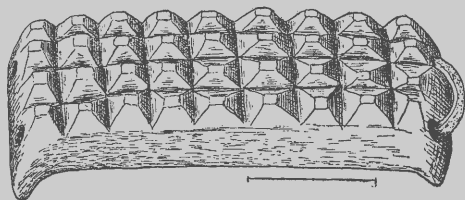
Cat. Nos. 46261 and 46260, U. S. N. M. Collected by E. W. Nelson.

teen little obtuse points or projections beneath, and is fastened to the foot in exactly the same manner as the foregoing. Short rude snowshoes are used for ice creepers by Chukchi and Eskimo about Bering Strait.

¹Langsdorff, "Voyages," London, 1814, II, p. 292.

²Hooper, "Tents of the Tuski," London, 1853, p. 185.

Example No. 46260 (fig. 96) is another specimen from the same locality, which is interesting because of the variation in detail. The shape is rectangular in outline on top, but is chamfered beneath around all of its margins, and also the margin of the cavity in the middle has been chamfered, so that beneath were left two long edges, like sled



Figs. 97 and 98.

ICE CREEPERS OF IVORY, FROM ALASKA.

Cat. Nos. 63881 and 44761, U. S. N. M. Collected by E. W. Nelson.

runners; by cutting away notches in these pyramidal points were formed. The lashing is similar to those before named.

Example No. 63881 (fig. 97) is from St. Lawrence Island, and exhibits another stage in the process of elaboration. The general shape is quadrangular. The upper part is cut so as to fit around the foot a little better. There is no excavation from the middle, but by a series of furrows filed on the underside, three longitudinally and eight laterally, a series of thirty-six pyramidal projections are effected. The lashing or attachment to the foot is exactly as in the preceding one.

The last step in this evolution, or practically fading out of a type of invention, is a specimen from Sledge Island, No. 44761 (fig. 98), collected by E. W. Nelson. This is also a rectangular specimen. The edges are chamfered all around. Underneath a broad furrow is gouged longitudinally through the middle and ridges remaining are filed across, leaving two rows of projecting pyramids. So far as the collections in the U. S. National Museum are concerned, this peculiar device does not seem to have gone any farther southward on the American side.

Murdoch says that in early spring, before it thaws enough to render waterproof boots necessary, the surface of the snow becomes very smooth and slippery. To enable themselves to walk on this, the natives make a kind of creeper of strips of sealskin, doubled lengthwise and generally bent into a half moon or horseshoe shape, with the folded edges on the outside of the curve sewed on the toe and heel of the sealskin sole.¹ (Fig. 99.)



Fig. 99.

ICE CREEPER ATTACHED TO BOOT SOLE.
Point Barrow, Alaska.
From a figure in the Ninth Annual Report of the
Bureau of Ethnology.

¹ Cf. Ninth Ann. Rep. Bureau of Ethnology, p. 135, fig. 82.

In example No. 56750, a pair of boots from Point Barrow, Murdoch draws attention to a large round patch of seal skin with the hair on, and pointing toward the toe, to prevent the wearer from slipping. These patches are carefully "blind stitched" on so that the sewing does not show on the outside. On the Amur snowshoe the hair is pointing backward to prevent slipping.¹

At Point Barrow, says Herendeen, the Eskimo make an ice creeper by rolling up rawhide and sewing the strips across the boot, which should be compared with the Ungava plan.

The boots of the Northern Labrador Eskimo are peculiar. The soles are often made with strips of sealskin thongs sewed on a false sole,

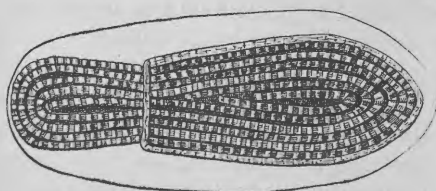
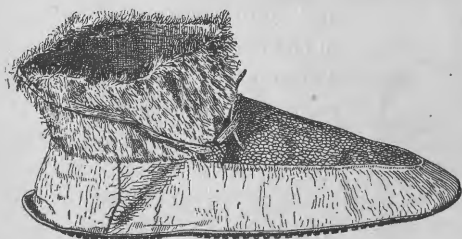


Fig. 100.

ICE CREEPER ON BOOT SOLE. HUDSON BAY ESKIMO.

Collected by L. M. Turner.

From a figure in the Eleventh Annual Report of the Bureau of Ethnology

example No. 165588 in the U. S. National Museum. Their god knukamtihiksh wore them. It is not a snowshoe at all in the sense of sustaining a person on the snow, but a net in the form of a moccasin drawn over the latter as an overshoe. It is made of coarse twine, in twined weaving, with a mesh about an inch wide. A similar makeshift, example No. 165558 in the U. S. National Museum, is from the Moki pueblo.

which is attached to the undersurface of the sole proper. The strips of thong are tacked on by a stout stitch, then a short loop is taken up and another stitch sews a portion of the remainder of the strip. This is continued until the entire undersurface consists of a series of short loops, which, when in contact with the smooth ice, prevent the foot from slipping; not made in any other portion of the district.² (Fig. 100.)

An interesting example of the fading out of a device is seen in the wipka or skeleton shoes of the Klamath Indians,

ICE CREEPERS IN THE U. S. NATIONAL MUSEUM.

Museum number.	Specimen.	Locality.	By whom contributed.
73092	Snowshoe and ice creeper (fig. 93) ...	Aino, Japan	R. Hitchcock.
2433	Ice creepers, ivory (fig. 94)	Chukchi	Commodore Rodgers.
46260-46262	Ice creepers, ivory (figs. 95, 96)	Plover Bay, Siberia	W. M. Noyes.
63300	Ice creepers, ivory	St. Lawrence Island, Alaska.	E. W. Nelson.
126982	do	do	Do.

¹ Cf. Ninth Ann. Rep. Bureau of Ethnology, p. 132.

² Ibid., p. 179.

ICE CREEPERS IN THE U. S. NATIONAL MUSEUM—Continued.

Museum number.	Specimen.	Locality.	By whom contributed.
63881	Ice creepers, ivory (fig. 97)	St. Lawrence Island, Alaska.	E. W. Nelson.
44361	Ice creepers, ivory	Cape Nome, Alaska.....	Do.
44559	do.....	Sledge Island, Alaska ..	Do.
44761, 44762	Ice creepers, ivory (fig. 98)	do	Do.
49176	Ice creepers, bone.....	Alaska	Do.
153439	Ice creepers, Eskimo.....	do	J. C. Russell.
90189-90193	Shoes with crimped soles	Ungava, Canada.....	L. M. Turner.
105588	Twined over-moccasins	Klamath Indians, California.	Bureau of Ethnology.

PRIMITIVE MAN AS A CARRIER.

Among the numerous epithets applied to man it must not be forgotten that he is a carrying animal, an emigrating animal. Other species carry objects, but they make no carrying devices; fishes and birds especially are migratory, but they go in annual circuits, many of which they have



Fig. 101.

VIRGINIA NEGRO ON THE ROAD.

From a figure in the Report of the Smithsonian Institution (U. S. National Museum), 1887.

been repeating since the glacial epoch. Many animals are provided by nature with pouches and carrying organs. So men also have excellent hands and arms, relieved of the toilsome work of walking so that they may be more free to grip and hold.

In this chapter it is designed to trace the progress of early and more primitive forms of invention as applied to the carrying industry. Nowadays one may see men in the double rôle of carrier and of rider; they carry and are being carried, which gives rise to the two generic terms, freight and passengers. The freight of the world as well as its passengers are either carried or hauled, and these separate functions divide men into pack animals and traction animals.

For carrying on the head or toting, according to the shape of the load and the skill of the bearer, there may be (1) nothing to hold the load on; (2) one or both hands may grasp the burdens; (3) the forearm may rest between load and head; (4) a pad, having many patterns from land to land, may sustain the load on the head and support it when placed on the ground; (5) the receptacle may be made convex at the bottom by an added rim or by punching up.¹ Finally, the load may be hung from the head by means of a headband and slings or straps. In such cases there is a double resting place for the back and shoulders and hips, all assist in sustaining the burden. Furthermore, the student will notice that the head strap rests against the forehead in some instances and against the bregma in others, as in the Apache water carrier. This same head or forehead band will occur in certain tribes as an instrument of traction. Toting as against carrying with the headband will also be found to have relation to natural resources, and hence to tribal and ethnic custom.

It should be noticed in this connection by craniologists that among savages that carry loads on the head or use the burden strap or other devices about the forehead, children are taught and compelled just as soon as they can walk to carry loads. Small jars, baskets, frames, or packs are loaded upon them at first, and these are increased with age. Again, in many tribes carrying methods are a matter of sex, so that if any modification of the skull takes place by the act it would show itself in one sex and not in the other.

CARRYING PADS FOR THE HEAD IN THE U. S. NATIONAL MUSEUM.

Museum number.	Specimen.	Locality.	By whom contributed.
77189	Head pad for packing	Hupa Valley, California	Lieut. P. H. Ray, U. S. A.
126907	Head pad, leather and grass twine ..	California	Do.
84107, 84108	Belt for carrying burdens, Moki	Arizona	V. Mindeleff.
84109, 84110	Head pad, Moki Indians	do	Do.
22828	Rope for carrying wood, Moki	do	Maj. J. W. Powell.
70962-70974	Head pads (thirteen), Moki Indians ..	do	Col. Jas. S. Stevenson.
40473	Head pads (fig. 161) Zuñi	New Mexico	Do.
41760	Carrying strap, Moki and Zuñi	do	Do.
41761	Carrying strap, hood rope, Moki	do	Do.
42156	Carrying band, plaited, Moki	do	Do.
70980	Headband	Mexico	New Orleans Exposition.
152720	Carrying gourd and yoke	Colima, Mexico	Edward Palmer.

¹Ratzel figures a Schilluk woman, barefooted, with a jar on the head, supported by the wrist of the right hand and grasped at the rim with the left.

CARRYING-YOKES AND HEADBANDS IN THE U. S. NATIONAL MUSEUM.

Museum number.	Specimen.	Locality.	By whom contributed.
167783	Yokes.....	Finland.....	Hon. Jno. M. Crawford.
73386	Carrying strap.....	New Guinea.....	D. S. Spaulding.
151120	Carrying pole.....	Sandwich Islands.....	Mrs. Sibyl Carter.
153361	Carrying bands.....	India.....	W. H. Dall.
153557	Carrying rope, goat's hair.....	Kashmir, India.....	Dr. W. L. Abbott.
150679, 150680	Carrying band.....	Yezo, Japan.....	Romyn Hitchcock.
150683	.....do.....	.....do.....	Do.
150757	Carrying band and stick.....	.....do.....	Do.
77112	Headband.....	Seoul, Korea.....	J. B. Bernadou.

The shoulders and back are favorite places for men's burdens; women a little more commonly prefer "toting." The roustabouts and wharf men set all sorts of sacks upon the shoulder for short distances. The sack holds its own as a carrying utensil on their account. The shoulder not only lends itself to actual burden bearing, but has been the occasion of inventions in the following directions:

(1) In the utensil that fits and holds the load—the receptacle or package (fig. 134).

(2) In the carrying device itself, the vehicle.

(3) In the attachment of the burden to the man, the harness (fig. 102).

These are not always separate, and not even ever present, but the operation must always embrace the use of something answering to these and out of which they were elaborated.

Carrying is done on one shoulder, on both shoulders, and on the shoulders and neck.

All the eastern Asiatics and the Polynesians carry a load first on one shoulder, then on the other, by means of a shoulder pole.

The race of peddlers and of men with little impedimenta in Europe and America go about with their belongings in a pack borne on the end of a stick, resting near its middle on the shoulder and grasped by the hand at the other end (fig. 101).

African porters, as will be seen, have their load on one shoulder, either with or without carrying-frame, and relieve that shoulder by putting the middle of the staff on the other shoulder and catching the lower end of the staff beneath the load behind (fig. 103).

Finally, the Caucasian literally wears a yoke, so carved out that it



Fig. 102.

CARRIER'S SHOULDER-PADS FROM MUHAMBA, AFRICA.

Cat. No. 151132, U. S. N. M. Collected by the U. S. Eclipse Expedition.

rests on both shoulders and the atlas at once (figs. 108, 109). The "porter's knot" is an invention which combines head, atlas, and shoulders into one resting place for enormous burdens (fig. 110).

But, somehow the back has come proverbially to be the seat of the human load, so as to leave the arms free. Knapsacks, carrying frames, porters' packs, and the thousand and one devices for long marches are designed for the back, especially in Europe and aboriginal America.

The head-strap load, the breast-strap load, the shoulder-strap load,



Fig. 103.

ANGOLA NEGRO CARRYING ON THE SHOULDER.

From a photograph in U. S. National Museum.

the sack held over the shoulder by its mouth, all rest against the leaning back, and are sustained upon the center of gravity of the body. Allied to this back load is the burden on the hip and on the thighs.

Besides these wholesale methods there is the infinitely varied retail method of bearing small packages on the hands, arms, breast, stomach, and knees, which together afford room for regional, racial, and cultural variations of apparatus. One will see in pictures of Brazil, for instance, a servant carrying a bottle of wine or fruit on the head as a feat of agility in toting. In another place, men are trained to the knack of carrying

after other fashions, until they seem to take on certain gaits and styles of walking. But it is along the docks and retail streets that one will witness the survival of all modes of burden bearing in vogue since human history began.

The devices for carrying loads will first receive attention; after that the carrying of children and adult persons. Following the method of the former chapter, it seems more convenient, from a museum point of view, to continue the geographic order, regarding—

- (1) Africa in its negroid portions.
- (2) Caucasian Africa, Europe, and Asia.
- (3) Semitic and southern Asia.
- (4) Northern Asia and its appendages.
- (5) America.

This order is generally followed so as to bring geographic areas into contact where there has been also industrial contact.

A common sight in the landscape of negroid Africa is that of a woman with an immense jar on her head, steadied not by her hair or by a carrying ring, but by her naked forearm resting between the head and the jar or gourd. Her other hand may or may not hold to the rim. These toting negroes are now all over the warm portions of the world. No sight is more common in the streets of Washington than that of an old negress with an immense bundle on her head. In their native countries the negroid tribes have invented apparatuses for carrying.

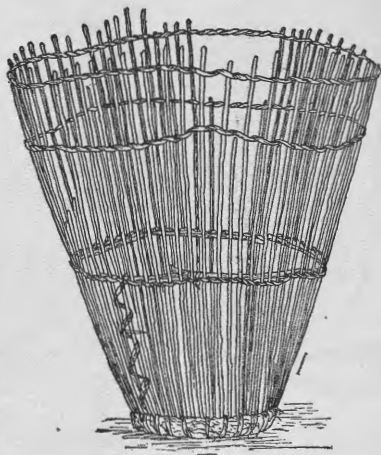


Fig. 104.

CARRYING-CRATE FROM ANGOLA, AFRICA.

Cat. No. 151129, U. S. N. M. Collected by Héli Chatelain.

Example No. 151129 (fig. 104) is a rude carrying or packing basket from Angola. The bottom is made in form of a mat or head pad. The warp is a series of rods, and the weft is in twined weaving, common in Africa, in eastern Asia, and in the Pacific States of North America north of the Pueblo country. The lower row of this twining should be noticed as a bare suggestion of which the bird-cage baskets of California and Oregon are the fine art. It is designed to introduce a little more rigidity into the texture. In this specimen the complete carrying baskets of many lands appear almost as a skeleton, and there are many variations of this type in West Africa.

A carrying basket from the Herero African tribe in the Berlin Museum für Völkerkunde is a little on the plan of the typical bean basket of the Mohave, but much shallower. Its motif is hoops and sections of hoops in three series held in place by windings of bast. At

the top is a wooden hoop. To this hoop are lashed three segments of hoops outside, their ends close together on opposite sides, like meridional lines. Inside these are laid segments of hoops of smaller size, at right angles to the three and parallel to one another, like the wires in a rat trap.¹

Example No. 152612 (fig. 105) is from the French Kongo, the gift of the Cincinnati Museum Association. In this specimen the common wicker-work is used; that is, a rigid warp and flexible filling. It is seen in America in three culture regions, that of the birch, ash, and oak splint, that of the split cane, and in one Pueblo in northeastern Arizona made from little twigs of *Hilaria Jamesii*. The plaited headband of the specimen here figured would also be familiar in America.

Baker furnishes excellent examples of varied carrying among the Madi negroes: Four men bearing a house-frame on their heads and spears or bows in their hands; woman with hamper on the head and child astride the hips; woman with hamper on the head and gourd in net borne in left hand; bottle in net and child clasped in the arms against the stomach; man with great bundle of long poles on back, shoulders, and head, held in place with both hands, the small ends dragging on the ground; the whole party are driving a herd of cattle.



Fig. 105.

WOMAN'S CARRYING-BASKET WITH HEADBAND.

Cal. No. 152612, U. S. N. M. Collected by C. Steckelman.

with board bottom and latticed sides. The crate is supported by a band across the forehead and a strap over each shoulder, attached to the borders of the crate. This should be compared with a picture in v. d. Steinen's "Unter den Naturvölkern Zentral-Brasiliens," pl. VI, and page 237.²

Ratzel reproduces from Cameron a Mrua man barefooted, wearing only a cloth about the loin, carrying a plain or self bow in the right hand, a spear in the left hand, and three arrows under his left arm. On his back, knapsack fashion, is a bale of goods, and suspended on his left side from his left shoulder hangs a fish basket and scrip or small haversack.³

Example No. 169128 (fig. 106) from Kongo Free State, Africa, is a carrying frame or basket, collected by J. H. Camp. The essential parts, as of many others in the U. S. National Museum from the area of African

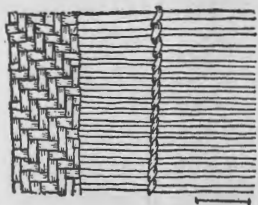
¹ Figured by Ratzel, "Völkerkunde," Leipzig, 1887, I, p. 333.

² Cf. Ratzel, "Völkerkunde," Leipzig, 1887, I, p. 596.

³ Ratzel, "Völkerkunde," Leipzig, 1887, I, p. 92.

porters, are the two substantial bamboo rods along the bottom; around this a network of bamboo fillets in twined weaving is constructed, and the flat border finished off in diaper weaving. The staff always accompanies this device, not only to support the carrier, but to place on the vacant shoulder as a fulcrum in order to help support the frame.

Example No. 151132 is a Muhamba carrying frame from Portuguese West Africa, collected by Héli Chatelain. The fundamental parts are the rods and the sides. The rods are two poles about 6 feet long, laid parallel, like the frame of a bier upon which the apparatus



is built up. In the economy of the carrier these poles serve as foundation for the frame, as holds for the hands, and the projections of the rods enable the carrier to set his load upon the ground and to resume it without much stooping. The sides of the apparatus are two-netted hoops. Each hoop is a stick bent into an elongated ellipse, and lashed to

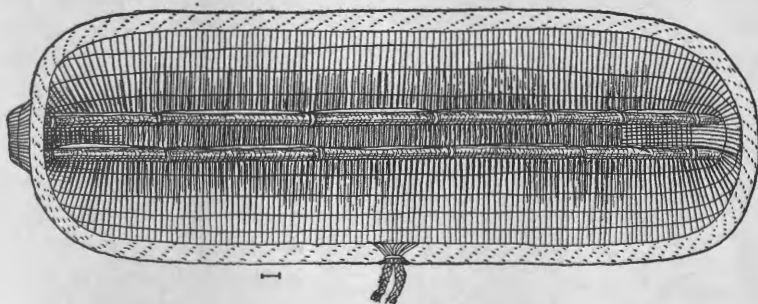


Fig. 106.

CARRYING-CRATE OF CANE FROM KONGO, AFRICA.

Cat. No. 169128, U. S. N. M. Collected by J. H. Camp.

the poles. The network consists of quadrilateral meshes made of cane splints served neatly all over with finely split cane. Between the chief meshes and subdividing them is a series of meshes in wrapped style of weaving. The poles are held in place by cross-pieces, and the space padded beneath to protect the shoulders. These frames are convenient in packing, and the load is required to be put up in such manner as to fit them.¹

Serpa Pinto figures a Biheño carrier with his regulation pack fastened between the parts of a forked stick and borne on the shoulder. His belt is a regular arsenal and commissary.² This may be compared with the West African and Kongo pack.

Example No. 72708, received from the Museum für Völkerkunde, Leipzig, is the most interesting specimen of this type of frame for the reason that it is constructed from two palm leaves and may be made

¹ Cf. Steinen, "Unter den Naturvölkern Zentral-Brasiliens," pl. VI, p. 72.

² Ratzel, "Völkerkunde," Leipzig, 1887, I, p. 194.

without the use of metal tools by laying the stems parallel and a few inches apart. The leaflets on the sides of the stem that are toward each other are interwoven, which forms a prolonged webbing on which the load may rest. The leaflets on the outside of each stem are twisted for a few inches and their ends are braided down together to form a continuous upper border of the apparatus. This construction will be best seen by examining fig. 107. Nothing could be simpler than this device, and yet it is an attractive object, containing all of the elements of the most finished carrying frame from the African region.

There are over one hundred thousand carriers on the Kougo. They are almost naked African savages, and yet the produce they bring is on its way to the great streams of world commerce. Each one of them carries a load of 75 pounds 12 or more miles a day, making in round numbers a unit of 1,000 pounds 1 mile.

Among the Kasai and other woolly-haired tribes, as well as in the Papuan area, the women carry water jars on the shoulder. The reason seems to lie in the great care that is taken of the hair. Enough material does not exist in the U. S. National Museum to test the question whether Friedrich Müller's division according to hair is tallied by the two customs of head carrying and shoulder carrying respectively. The jars are always round bottomed and the roads tolerably level.

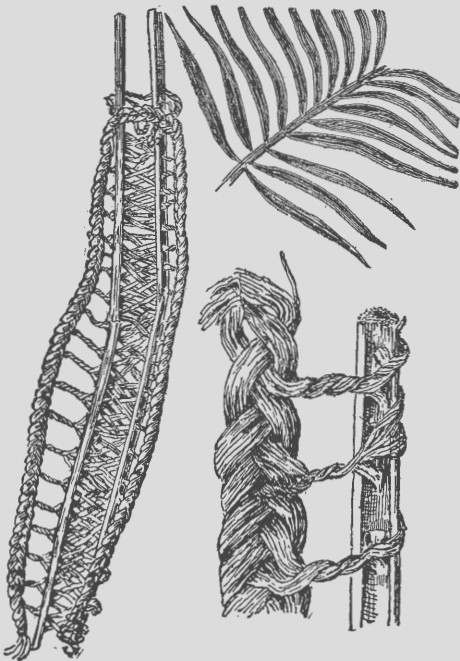


Fig. 107.

PRIMITIVE CARRYING-FRAME OF BRAIDED PALM LEAF.

Cat. No. 72709, U. S. N. M.

These same round jars or gourds, in order to be carried in other ways, must be protected. The most common and natural style of sling or lashing for a rotund jar or gourd consists of two small circles of some flexible material near the top and the bottom united like the snare of a drum so that they can not move either way. A cord attached to either of them or around the bottom and united with them will be efficient. The jar and the gourd being frail, the sling has often padding added or protection at exposed points and extra bottoms are attached to the lower ring.

In the rattan region this inclosure of the gourd is most efficient and elaborate. In many examples the network is tastefully knotted and

ornamented and provided with a bottom and a bale. The vessel may be carried then after any fashion; may be set down and will support itself; is guarded against destruction by a blow. The U. S. National Museum possesses a great variety of such vessels, which are usually devoted to the transportation of water, oil, milk, etc.

A very elaborate mounting for carrying a gourd bottle, in the U. S. National Museum, is No. 5587, from the Kongo. A conoid carrying basket is formed of a warp of bent rods crossing at the bottom, fitted to the gourd and held in place by weaving in leather thong and cotton thread. Palm oil, animal fat, milk, and other food liquids, as well as pombé and native fermented drinks, are kept for immediate use in such inclosures. They are well known to collectors by their indestructible rancid odor.

Example No. 76281 is a long carrying gourd from the Kongo, collected by Hon. W. P. Tisdell. It is mounted by boring a hole in the side near the small end, cutting off the end and running a noose up from the former hole through the latter. The knot at one end of the noose forms

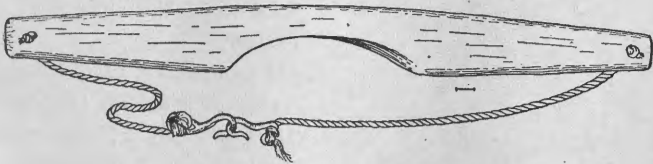


Fig. 108.

ENGLISH CARRYING-YOKE.

Cat. No. 131093, U. S. N. M. Collected by Edward Lovett.

the toggle and the bend the means of attachment. The gourd is about 30 inches long and 3 inches thick.

It will be convenient to insert here some of the survivals of primitive carrying apparatus and methods in vogue in Europe. Indeed, every form of transportation may be witnessed on the farm and garden, about the docks, and along the commercial streets, and especially in the markets. Every part of the body fit to carry any object is harnessed. Every kind of harness for attaching the load to the person is in use. Every sort and shape of receptacle for holding loads and holding them on survives. Finally, in the great commercial centers, all things that have been carried elsewhere must be borne again.

The carrying yoke (example No. 131093, fig. 108), from England, is a type of harness widely dispersed in northern Europe and among the colonists from that area. Dr. W. J. Hoffman found the Indians of Wisconsin and Minnesota carrying water and maple sap in buckets made of birch bark on their backs by means of this yoke. The parts of the utensil are the horizontal piece, or the yoke itself, and the slings. The yoke itself is wider than it is thick, is rounded on all corners, for ease to the carrier, and tapers toward the ends to reduce weight.¹ It

¹ Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1887, p. 285, fig. 40.

also serves another purpose in common with all other carrying poles, it holds the loads away from the body. Whoever has tried to carry two pails of water with his hands alone knows this. It is a common thing in the country to see the boys and women using a hogshead hoop as a spreader. In the cities two ice men carry an enormous block by both holding to the hooks and one pushing against the shoulder of the other for a brace. This triangulation of lift and push is excellently illustrated in the style of carrying in vogue among the peasantry of Europe. The yoke is practically reversed. A strap or rope about 6 feet long, with a hook at each end, is worn over the neck and the hooks attached to the bales of the buckets to be carried (fig. 109). This enables the bearer to use both arms and neck, for the hands may grasp either



Fig. 109.

SUBSTITUTE FOR NECKYOKE USED BY WOMEN IN
NORMANDY.

From a figure by Dupré.

the carrier to take any kind of load at will—boxes, bags, furniture, in short, every sort of freight that is hauled in London or Liverpool and carry it to and from the wagon or car. The rather crude drawing of a knot collected on Thames street, London, will help the reader to see that the porter may use and rest in turn the head, the back, or either shoulder. The modern packing box or barrel, with ugly corners, nails, hoops, and hoop iron, are also kept from lacerating the flesh. The combined activity of these thousands of carriers by whose agency great piles of freight appear and disappear incessantly reminds one of the silent power of those great rivers at whose bidding islands of débris are formed and carried away.

The bearing of burdens on the scapula (fig. 111), as among the Eng-

the handles of the hooks or the bales of the buckets. In order to hold the loads away from the person four sticks are framed together, and the two crossbars are laid against the bales of the bucket on the side next to the carrier.¹

Example No. 131091 in the U.S. National Museum (fig. 110) is a "porter's knot," procured in London by Mr. Edward Lovett. This specimen is a hard pillow, after the general plan of a horse collar. A band passes around the forehead and the knot or pad rests on the shoulders and the back. Its uses are twofold, first to protect the head and body from injury, and to perfect this function a cap of stout leather is worn. The chief use, however, is to enable

¹"Art of the World," D. Appleton & Co., New York, p. 76.

EXPLANATION OF PLATE 22.

MARKET WOMAN IN DRESDEN SELLING VEGETABLES.

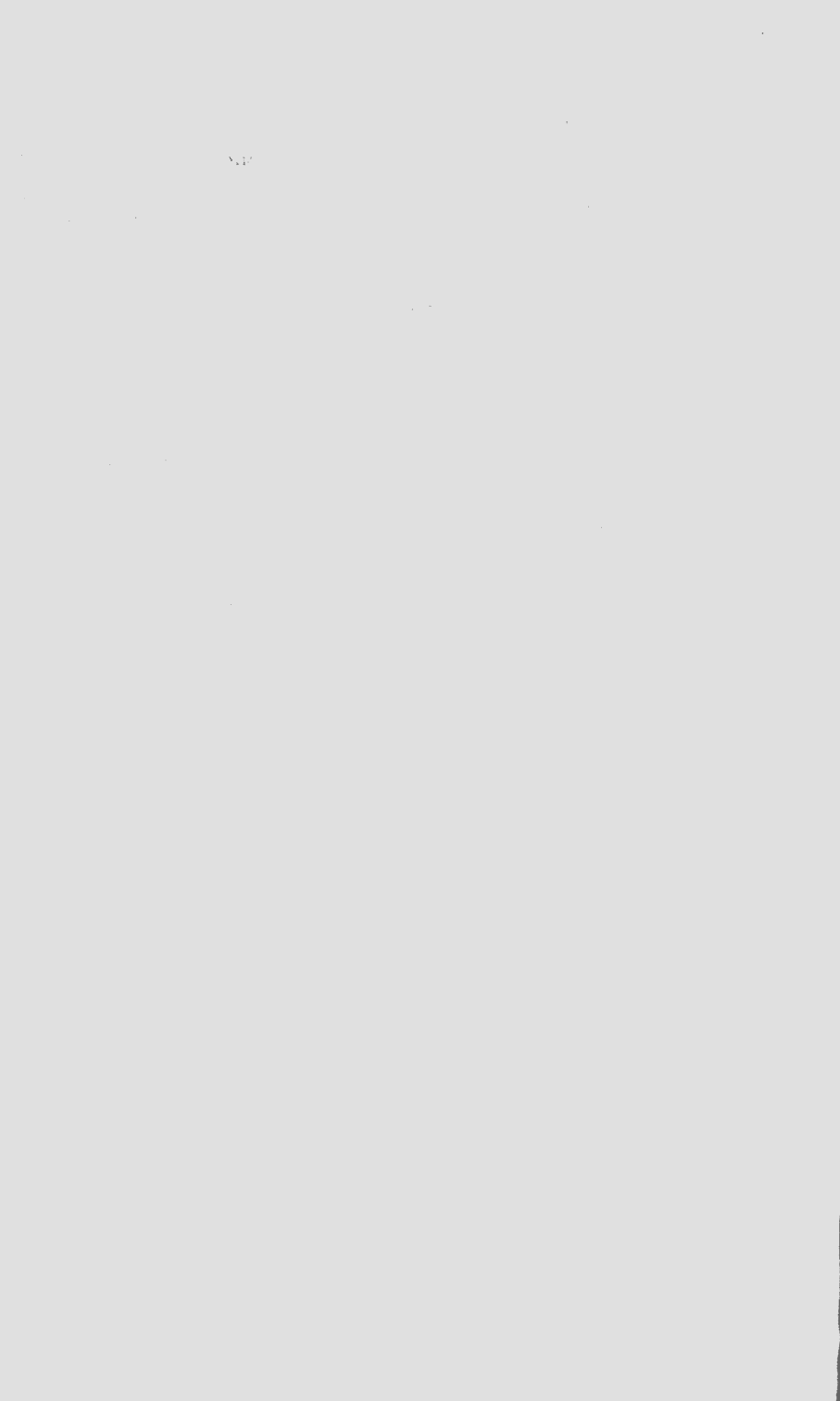
The noteworthy features in this connection are:

- (1) The wicker carrying basket, strong and flexible, for the back.
 - (2) The knapsack straps, made fast to the upper edge of the basket and buttoned at the lower end under the projecting ends of the frame posts, making it perfectly easy for the woman to harness or unharness herself.
 - (3) The hamper basket, with two handles, for field work and not for the road, carried in front of the body or upon the shoulder or nape of the neck.
 - (4) The pack or bundle, easy to carry on the arm, in the hand, or on the shoulder.
- In this picture is an example of the most active folk industries in one of the most enlightened cities of the world.

From a photograph in the U. S. National Museum.



MARKET WOMAN IN DRESDEN SELLING VEGETABLES.
From a photograph in the U. S. National Museum.



lish porters, must be very old, for it was long ago æstheticized in the *Atlantides* and *Telamones*, the first term relating, doubtless, to Atlas, who bore up the vault of heaven on his shoulders, and the second to the *Telamonian Ajax*.¹

While the southern Europeans and the races allied to them affect the toting habit, the northern Europeans, especially the German race, carry burdens on the back. The soldier and his knapsack, the peasant, and the drudgery woman with her basket furnish the ever present picture.

The German carrying basket (pl. 22) is a model of convenience. It exists in many materials, sizes, degrees of finish, and it varies somewhat in form according to special functions. But all of them are practically

knapsacks. The side of the basket next to the carrier's back should be somewhat flat. The straps for the shoulders are attached near the top of the apparatus, and they both have a loop or eyelet at the bottom to fit over the ends of the frame sticks which project downward below the basket to receive them. These loops and projections are of the greatest possible convenience, for the carrier does not have to rise painfully with her load. She sets it upon any accessible rock or table, turns her back to it, brings the straps over her shoulders, and buttons the eyelets over the projections at the bottom of the basket. She has nothing more to do than to bend her back, adjust herself to the load, and walk off. Other modes of carrying are in vogue, practically, every other, and the mode here described exists elsewhere, but the peaceable knapsack is, after all, the favorite style of burden bearing with the Germanic people.² In periodicals one will now and then see a picture of a German woman carrying dirt in a knapsack basket up a hill, and children drawing her along by means of a rope working round a pulley.³ The occasion of this is as follows: The constant working down hill of the light loam by farming and by the rain impoverishes the hilltops. In order to enrich them again the men carry the fertile dirt uphill in baskets on their backs and the women resort to the device above

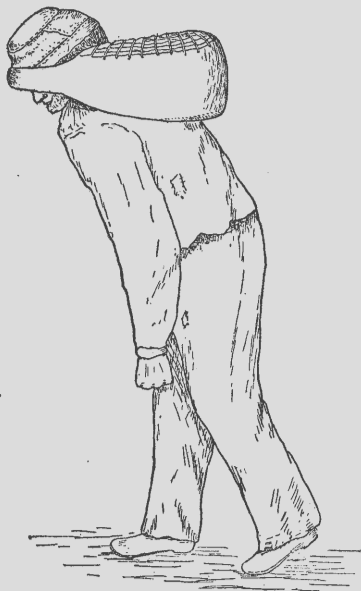


Fig. 110.
PORTER'S KNOT, AS SEEN ON THAMES STREET,
LONDON.
Cat. No. 131091, U. S. N. M. Collected by Edward Lovett.

¹Smith, *Dictionary of Greek and Roman Antiquities*, s.v., *Atlantides*.

²Cf. U. S. Consular Report No. 103, March, 1889, p. 431; Mason, "Woman's Share in Primitive Culture," New York, 1894, p. 124, and "The Human Beast of Burden," Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1887, p. 285.

³*Zeitschrift des Vereins für Volkskunde*, Berlin, 1894, v, pl. 1.

spoken of. In the figure given by Miss Rehsener, there is a tripod shown on the top of the hill and a pulley attached to the crossbar. One woman at the foot of the hill is filling a basket with rich dirt by means of a shovel. A long rope is attached by one end to the basket on the back of the woman. The middle of the rope is around the pulley, and three children are drawing at the other end. The cooperation in this simple process is perfect. One basket is being filled, one is on the carrier's back, and a third is being brought to the starting point by the children.

Example No. 28155 (fig. 112) is a Lapland wallet made of spruce root. This is a species of network made as follows: A two-ply twine for about 9 inches forms the foundation along the middle of the bottom. From that point, as the twine proceeds in a coil, at every turn one of the



Fig. 111.

MADEIRA WINE CARRIER USING FOREHEAD, SHOULDERS, AND BACK.

From the Report of the Smithsonian Institution (U. S. National Museum), 1867.

strands is extended or expanded into a loop, which passes backward around the preceding twine by a double twist, and then the original twining proceeds for another loop and double turn, when strand number two is expanded to form the next loop or mesh, and the whole process consists in twining and alternately making both the strands a loop around the cord of the preceding coil. The whole operation is a process of alternate twist and loop, making meshes about three-fourths of an inch square. The handle consists of a three-ply rope made of the same spruce root. One single cord makes both handles knotted on one side to form the double loop. Depth of the basket, 9 inches.

This species of twining and looping is essentially hand work, and is rather netting than weaving. That is, there is no warp and weft, but the two are one, built up mesh by mesh with the fingers. The wallet is useful for all carrying purposes, being tough and light.

As remarked, the melanochroic peoples of Europe, in their devices for carrying, resemble the North Africans and the Semito-Hamites generally. The women carry loads on the head; the men over the backs like peddlers, or on a shoulder pole, as did the ancient Egyptians, the Irish peasantry, especially the women. The writer has seen a young woman toting a pail of milk on her head and carrying one in each hand, thirty quarts in all, seemingly with great pleasure.

The Greek and Roman *asilla* was a pole of wood held on one or both shoulders for carrying burdens, which were attached to the two ends. Smith figures a dwarf, a grasshopper, and a faun, each bearing loads therewith, showing how this drudgery thing had become a motif in art and mythology.¹ In Greece the term *ἀναφορεός* is applied to every carrying device, strap, pole, yoke, etc. This southern European carrying pole, however, is not the English yoke. It may be seen in hundreds of pictures of Egyptian laborers, and has its greatest development in eastern Asia, south of the great divide.

The carrying yoke laid on both shoulders or biceps is shown in Roman art.² The Egyptian clay and brick bearers seem to be wearing the yoke after the Chinese fashion.

The Greek *κάλαθος* was the basket in which women placed their work, and is figured like the waste basket at the office desk, a truncated cone or cylinder of wicker. It was also a religious emblem and is found associated with Minerva, who taught women the art of weaving; with Demeter or Ceres, the goddess of harvest; with Tellus and other divinities, as an emblem of abundance. It was frequently placed on the heads of divinities in ancient statues, and is thus called *modius* by archæologists. Carried on the heads of young women in processions it gave rise to the Caryatides.³

The Roman *ferculum* was a platform on which the images of the gods were carried in procession. Spoils of war and prisoners were borne in triumph on the same device. On the arch of Titus at Rome soldiers are figured as carrying the golden candlestick of the Jews on a *ferculum*.⁴

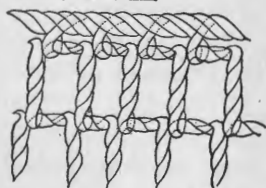
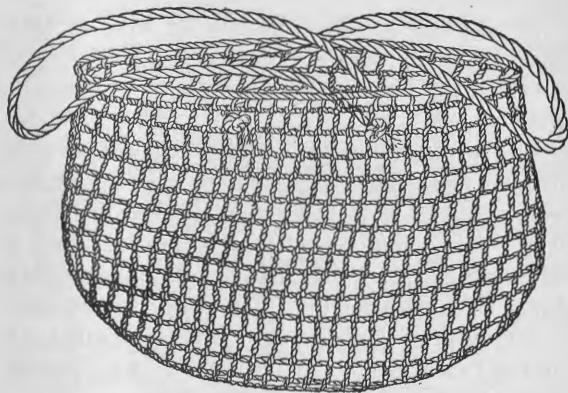


Fig. 112.

LAPLAND CARRYING-WALLET, MADE OF SPRUCE ROOT.

Cat. No. 28155, U. S. N. M.

¹Dictionary of Greek and Roman Antiquities, s. v., *Asilla*, with 3 figs.

²Smith, Dictionary of Greek and Roman Antiquities, s. v., *Corbis*, illus. from Herulaneum.

³Smith, Dictionary of Greek and Roman Antiquities, s. v., *Calathus*, with figure of Calathus on chariot and on the head of Serapis. Reference is made to Saglio's Dictionary, for description of priestesses wearing the Calathus.

⁴Figured in Smith's Dictionary of Greek and Roman Antiquities, s. v. *Ferculum*.

The enormous loads borne incessantly on the heads of women in Italy are shown in a painting by Gioli, exhibited at the Art Exposition at Venice in 1887. The women are all barefooted and poorly clad. They have immense bundles of brush upon their heads, and for the double purpose of staff and prop for the load each holds in the right hand a stout stick.¹

Upon the monuments and paintings of Egypt, as well as in the scenes of modern life, carrying may be seen in the following varieties:

(1) On the head, with or without head pad: with or without support from hand or arm.

(2) Picking up and carrying bricks with both hands, in the kiln and at the building. The carriers are in every attitude, and the study of them exhibits excellently the versatility of the human body in this industry.

(3) On the shoulder, in box or tub; in sack, and by means of the carrying pole, like the Chinese coolie.

(4) In the hand; with satchel, or in the infinite variety seen about the bazaars.

The salver or charger held in the right hand, extended in the presence of gods and great men, is one of the commonest appearances on ancient monuments. This practice has a ceremonial motive as well as that of convenience and respect. It is not right for a menial to touch the food of a superior, and the ceremonially unclean must not touch the food of those that have been purified regardless of rank.

The form of carrying food and drink on a waiter or charger resting on the two extended palms held forward, occurs again and again on Egyptian mural paintings and sculptures and survives in the waiters at most hotels.

Montfaucon has a picture of men in rows holding up and carrying the throne of a Persian King upon their uplifted hands.²

Herodotus mentions, as an example of the contrary ways of the Egyptians, that the women carry burdens on the shoulders while the men bear them on the head. But on the monuments even the testimony of Herodotus is reversed. And the women of the lower orders in our day carry water in large vessels on their heads. Now, as anciently, the women do the bulk of the carrying.³

The methods of carrying in ancient and modern Egypt are those also of Syria and Palestine. The multitudes of asses and camels in use lift the burdens from the heads of women and from the backs and shoulders of men, the former for short haul, the latter for long haul. Tristram speaks of the shepherds in Palestine carrying lambs not only under the arm, but in the hood of the *âbeih*, or cloak.

¹Mason, "Woman's Share in Primitive Culture," New York, 1894, fig. 36.

²"L'Antiquité expliquée," Paris, 1722, p. 183, pl. II.

³Lane, "Modern Egyptians," 1846, I, p. 267; Erman, "Life in Ancient Egypt," London, 1894, pp. 99 and 276.

For professional carrying and the daily round of burden bearing, as connected with the transportation of water, two inventions are in vogue, the pottery vessel and the skin bottle. In Egypt, where the donkey is also aquarius, the sharp-bottomed jar made to fit in a saddle pack may also be carried in a sling on the back. But, in the Holy Land, the use of the head in carrying water necessitates an entire change in the form of the utensil.

The water skin is simply the hide of the goat or some other animal, drawn off with great care; the openings all but one are closed tight, and straps added for the convenience of the bearer, according to whether he may live in a headband country or one addicted to shoulder or breast straps.

It is a common sight in Constantinople to see eight stout fellows carrying a tierce of wine by means of two parallel poles (fig. 113). The tierce rests in two rope slings. Each end of each rope is attached to the middle of a piece of wood, the ends of which are swung under both the



Fig. 113.

WINE BEARERS OF CONSTANTINOPLE.

An illustration of cooperative carrying.

From a photograph in the U. S. National Museum.

poles. This divides the load into eight equal parts. The poles extend beyond the tierce at either end, so that the men have no difficulty in walking. Elsewhere this cooperative carrying is still further amplified, and its survival may be seen at barn raisings, about shipyards, foundries, navy-yards, and in handling ordnance in the open.

Of the Arab women about Mosul, Layard says that they looked after their children, made bread, fetched water, cut and carried wood home on their heads. They did all the weaving, struck and raised the tents, loaded and unloaded the beasts of burden when they changed camp, drove cattle to pasture and milked them at night. When moving, they carried the children on the back as well as when about the daily toil. The weight of the large sheep or goat skin filled with water is considerable. It is hung on the back by cords strapped over the shoulders, and upon it was frequently a child unable to follow the mother afoot. The bundles of firewood brought from afar were enormous, concealing

head and shoulders of the bearer. The author speaks of one athletic girl, Hadla, who, having finished the task imposed by her mother, would assist her neighbors for pastime.¹ A good picture of such an athlete would in art stand for the genius of work. Emil Schmidt figures the Tamil women of southern India carrying loads upon their heads, at the same time bearing their children upon the arm and the hip.²

The following kinds of carriers appear on the black obelisk of Shalmaneser: (1) With hands held out in front; (2) with hamper held in both hands in front; (3) with wallet in right hand and sack held on left shoulder with left hand, most common; (4) with load held aloft over head in two hands; (5) with bundle of rods hugged in both arms; (6) with load held on shoulder in sack, like the wharf porter; (7) two men



Fig. 114.

CARRIER WITH WATER SKIN, FILTER, AND BOTTLE.

From a photograph in the U. S. National Museum.

with pole between them on the shoulder, load swinging; (8) with lead and driven camels; (9) with box or pack on the shoulder. No one is using headband, breast strap, knapsack straps, or any other device for fastening the load.

On the Chaldean and Assyrian monuments the diversity of carrying is well shown. For example: (1) The bearing of fans, fly brushes, umbrellas, food, and drink before gods and princes; (2) the sack over either shoulder; (3) the satchel in the right or the left hand; (4) the shield on either arm; (5) bow in left, arrows in right hand, great shield supported

on the back; (6) all sorts of loads borne on the head, two men with carrying pole, the load above, between, or below the supports.

In the figures of Kouyunjik gallery the men are building a mound, carrying earth in baskets on their backs. The lower tier of men are running down hill with empty baskets. In the photographs in the U. S. National Museum none of the groups show the endless-chain method of passing light objects along a line of men and women. The Polynesians practiced such economy. In the Hawaiian legend of the Royal Hunchback it is related that on the arrival of Pili in the islands, Paoa, the high priest, removed with him to Kohala. At Puuepa he erected a large *heiau*, the stones of which were passed from hand to hand a dis-

¹ Layard, "Nineveh and its Remains," New York, 1849, p. 291.

² Schmidt, "Reise nach Südindien," Leipzig, 1894, p. 10.

tance of 9 miles.¹ MacRitchie mentions a similar custom among the Picts. It was in vogue not many years ago at fires in villages, and in the Southern States watermelons and other fruits and fruit packages are handed along for considerable distances.

The use of the hides of animals in raising, carrying, and holding of liquids is confined chiefly to the Caucasian race, and is especially seen in their Mediterranean, Asiatic, and African areas (fig. 114). The goat's skin is particularly chosen because of its size and its texture. The hide is drawn off with as few openings as possible; these are tied up and calked and a harness of leather is attached for carrying, suspending, and emptying. In the illustration here given the skin is brought into proximity with the jar that in its form succeeds the goatskin in some lands. By comparing the harness with that of the Mexican aguador and others it will be seen that the strap for dumping, which is absolutely necessary in the skin, survives as of doubtful utility on the jar.²

In the Rig Veda leather water bottles, like those in use at this day, are mentioned.

India, southern Asia, and the Malayo-Polynesian islands may be considered seriatim on the notion of contiguity, regardless of race and environment. The carrying pole or Hindu *banghy* is omnipresent. Here a load on the hinder end is sustained by the hand in front. There the man in the middle sustains the pole with a load on either end, and in a third view, the load is in the middle and there is a man at each end. Other changes are rung on each of these. The methods of attaching the load to the poles are quite as numerous.

Example No. 27613 (fig. 115) is an elaborate carrying apparatus presented by the King of Siam. It consists of a pole and two baskets. Each end of the pole pierces a basket from side to side, holes having been provided for this purpose. The material of the structure is split rattan done in wickerwork. Cords are provided for packing the load

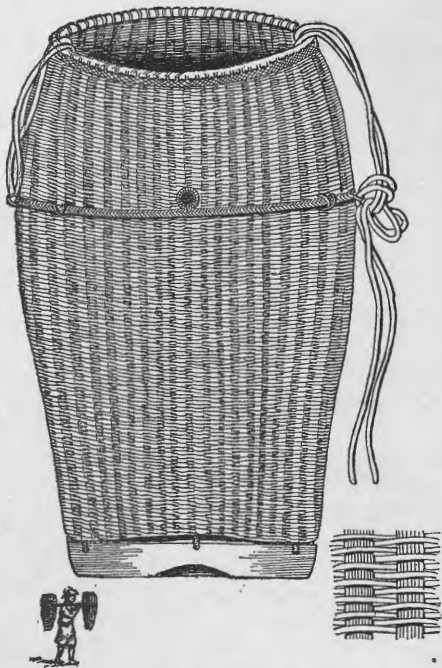


Fig. 115.

SIAMESE WICKER CARRYING-BASKETS, BORNE IN PAIRS WITH SHOULDER POLE.

Cat. No. 27613, U. S. N. M. Presented by the King of Siam, through Gen. John A. Halderman.

¹ Kalakaua, "Legends and Myths of Hawaii," New York, 1888, Webster.

² See also Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1887, p. 284, fig. 38.

and blocks of wood are attached to the bottom of each hamper to protect the weaving.

With this may be compared a precisely similar fashion from the Sandwich Islands. A photograph in the U. S. National Museum represents a Kanaka carrying two bundles after the manner of the Siamese, having thrust through each one of them an end of his carrying pole (fig: 116).

The U. S. National Museum possesses a number of immense gourds holding each several gallons, the gift of Mrs. Sybil Carter. In the absence of all pottery from the entire Polynesian area these gourds are the universal receptacle of things to be carried, clean or



Fig. 116.

CARRYING POLE.

Sandwich Islander carrying two bales by means of a shoulder pole.

From a photograph in the U. S. National Museum.



Fig. 117.

PRIMITIVE SHOULDER POLE.

Burmese boy carrying Jack fruit (*Artocarpus integrifolia*).

From a photograph by Rev. R. M. Luther.

unclean, liquid or solid. On the testimony of travelers and missionaries these gourds are slung in network and suspended from each end of the carrying pole. Wilkes says that the people are so wedded to this method of burden bearing as to use stones to balance the weights in the two packages. The stick is made of the *Hibiscus tiliaceus*, used also by the Kanaka in creating fire by the plowing method. Covers of gourd are sometimes fitted over the bottom ones to prevent the rain from wetting the contents. The gait of the carrier is a quick trot, with short steps.

The U. S. National Museum is indebted to Rev. R. M. Luther for the description and photograph of the most primitive form of the carrying pole and double load from Burma. A Karen boy is return-

ing home with two jack fruits attached to a stem of the same tree. (Fig. 117.) The drawing fails to show that the fruits are adhering to the original stem, but in fact they are, and this is the last analysis of the shoulder pole in which the stick, the perpendicular strings, and the weights are in one piece made by nature.

Weights are never carried on the head by the Nicobarese, but are invariably slung on a stick or pole and borne over the shoulder. A woman may occasionally be seen carrying on her head for a few yards, from her hut to the jungle, a basket containing a light load of pandanus drupes, but this is the only instance in which anything is borne on the head. As they are not in the habit of distressing themselves by taxing their powers of endurance, the distance that a man or woman will carry a maximum load without a rest rarely, if ever, exceeds a few hundred yards; in fact, it would appear that, though the physical powers of the average Nicobarese exceed those of the average Burman or Malay, there are many tasks performed by the latter from which the former would shrink as irksome and fatiguing.¹

Example No. 164745 (fig. 118) is a carrying basket from Jarawa, Andaman Islands, the gift of Enrico Giglioli. The texture of this specimen is a remarkable study. It should be compared with the Mohave carrying basket from southwestern Arizona.²

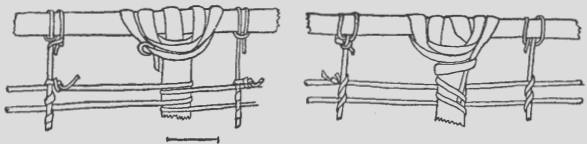
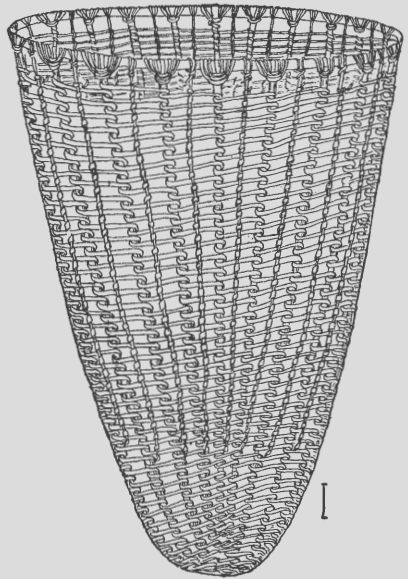


Fig. 118.

WOMAN'S CARRYING-BASKET, FROM THE ANDAMAN ISLANDS.

Cat. No. 164745, U. S. N. M. Collected by E. H. Man. Gift of Prof. Enrico Giglioli.

The upper rim is a rigid hoop. From this depend bamboo rods, doubled in the middle and attached to the hoops by their ends. These doubled rods cross at the bottom as the meridians do at the pole, in such manner as to lay the foundation for an inverted cone. Between these rods depend subsidiary and smaller ones, reaching down not quite to the bottom and

¹E. H. Man, *Journ. Anthrop. Inst.*, London, 1889, XVIII, p. 376.

²Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1887, p. 264, and Third Ann. Rep. Bureau of Ethnology, p. 403.

forming the warp of a weave soon to be described. The weft of the basket is a continuous splint of bamboo passing round and round outside the warp and wrapped once around the warp rods as each one is passed, crossing the subsidiary rods without winding around them. This wrapped style of weaving is seen also in some impressions left on mound pottery, and in specimens from the Lake Dwellings. It reaches its modern expression in wire gauze, where both elements are equally flexible, and a two-ply twine at the joint is the result.

Further detail of the weaving is necessary. The subsidiary vertical rods are crossed by the weft splints and are held to them by a third and still smaller splint coiled or seized so as to make one turn about each crossing of warp and weft. This style exists in its highest perfection in Vancouver Island and Washington State, and is most skillfully combined with twined weaving by the Yokaia Indians of central California.

The fastening off of the warp rods at the bordering hoop is worthy of study. The little subsidiary rods are fastened by a double loop, as may be seen on snowshoes and in hundreds of other objects.

The main warp rods are chamfered or whittled away thin so that the hoop may rest solidly on their tops, and the remaining splint is wrapped around the hoop and then makes a half hitch about it, first on the right then on the left of the rod two or three times, producing a firm and ornamental joint.

Example No. 73386 (fig. 119) is a carrying net from New Guinea, consisting of a network of stout cord attached to a pole bent in the form of a pointed oval or broad snowshoe. This is to be filled with portable objects and borne on the shoulder or back and not on the head or carrying pole. The method is more nearly allied to the African methods of the Kongo. There are also tribes in the interior basin of the United States that carry in nets.

Powell says of the negroid women of New Britain that they carry on their backs two or three cocoanut bags full of merchandise.

The water carriers of Port Moresby, New Guinea, are women (fig. 120). They wear skirts of fringed leaf, dyed a reddish brown. They make a globe-shaped vessel, which they carry very gracefully on the shoulder

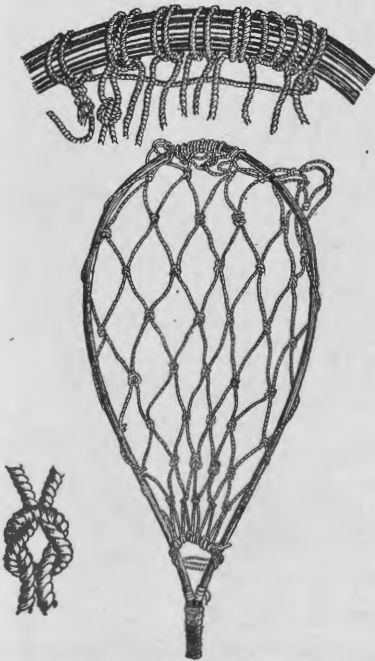


Fig. 119.

CARRYING-NET AND FRAME FROM NEW GUINEA
Cat. No. 73386, U. S. N. M. Collected by A. P. Goodwin.

well around on their necks, using the right hand to grasp it by the mouth and hold it steady. A small gourd is used in filling the vessel. In some areas on the Kongo, where the hair of the people is bushy and woolly and the coiffure is a matter of pride, this method of setting the round-bottomed water jar on the shoulder is to be seen.

The Philippine Islanders are a composite people of Negrito, Malay, and Sinitic elements, existing in all varieties of mixture. These Indonesians make pottery, and carry water therein. The round-bottomed vase is made to harmonize with the delicate and slightly pilose head by means of the headband, consisting of a scarf or sash deftly rolled up. In a collection of photographs made by Consul A. R. Webb the women are shown in various attitudes of holding, placing, poising, and removing the jar (figs. 121 and 122).

In this connection it is not difficult to understand how art is the glorification not of nature alone, but of industry. These caryatides have for their motive not some natural object, but a common human experience.

Example No. 74506 (fig. 123) is a carrying stick of bamboo, with baskets of bamboo. The pole is a piece of split bamboo, wider in the middle and notched at the ends to prevent the slipping of the load. The baskets of this

particular specimen are rather elaborately made of whole and split stalks, and paneled with the same materials. The inside is provided with cleats, on which shelves or drawers may slide, for holding and serving a number of dishes. The special treatment of the bamboo in making fast joints without nails or lashing will be better shown in the carrying chair from China, illustrated in this paper (fig. 229).

Example No. 54174 (fig. 124) is part of a carrying apparatus made of two bent bamboo splints, with a latticed floor on which to set the load. This and the specimen just before described were the gift of the Chinese Centennial Commission. It would be impossible to describe and figure the practically endless variety of inventions in China for the utilization of the shoulder pole. The bamboo also is a great blessing, since it lends itself to the inventor's mind with a plasticity almost equal to that of clay and with a toughness, according to weight, that can not be excelled by any other material.



Fig. 120.

PAPUAN WOMEN CARRYING JARS ON THE SHOULDER.

From a photograph in the U. S. National Museum.

Dr. R. N. Graves, long time missionary in China, contributes the following notes on the Chinese carrying trade in general:

The carrying poles of the Chinese coolies are of stout bamboo, about 6 feet long, or they use a pole of smooth, strong, flexible wood, about 2 inches broad by 1 thick, a long ellipse in section. A peg at each end, and the stick being somewhat widened, prevents the ropes or rattan slings from falling off. They shift the burden from one shoulder to another by means of the staff, and never use a yoke resting on both shoulders, as is seen in Europe. The skin on the shoulders becomes thickened and hardened, but not infrequently becomes sore and galled. They are truly beasts of burden.



Fig. 121.

PHILIPPINE WOMAN "TOTING" WATER.

From a photograph by Consul Alexander R. Webb.



Fig. 122.

PHILIPPINE WOMAN LIFTING JAR FROM THE HEAD.

From a photograph by Consul Alexander R. Webb.

As to the rate of travel and annual amount of goods carried, no definite information can be given. Most of the carrying is between the villages and towns 15 or 20 miles away and shorter distances. Formerly, before the opening of the Yang Tze to foreign trade, a great deal of tea was brought across the mountains from the central provinces, several days' journey, to the head waters of the Canton River, but this is discontinued. Most of the merchandise in South China is carried for long distances by the waterways. In the more thinly settled hills and mountainous districts it is carried on men's shoulders.

The Chinese wheelbarrow (fig. 125) is, in fact, a camel or donkey pack-saddle with its balanced, two-sided load. The wheel and the coolie's

legs are the locomotory part of the device. If the wheel be removed, the two sides of the burden would fit over the back of any pack beast and the track need not be widened. The Chinese do not at present extensively use this mode of transportation except in the cities, but the Tibetans employ both the yak and the horse. The camel is not far distant on the northwest, and in the Chinese tribute-pictures horses, asses, camels, elephants, and pack reindeer are seen. Hereabouts there are two other examples of the beginning of the wheel. The Baschkir cradle in Orenburg, Russia, with two little wooden block wheels, is figured by Pokrowski. The Korean carrying chair has often beneath it a single wheel, a very laborious device for taking a load from the back of an animal instead of putting it on.¹ In the exaltation of the royal person, ceremony decides the form of the vehicle. In the freight and passenger barrow of the Chinese there is no social distinction created between passenger and barrow man.

The women of western Tibet are healthy and hardy, and carry weights of 60 pounds over the passes. They wear shoes of felt and of straw.²

The Tibetans are very quick over their work. Each time they raise a heavy load they force out the air from their lungs by a vigorous hiss. They handle great weights with considerable ease, for their arms, though not muscular, are tough and set in solid shoulders, which are supported by deep necks, the length of their forearm being remarkable. Lamas, stick in hand, give their orders and reprimand them; but these savages do their work cheerfully and are obedient and respectful to the lamas, to whom they listen in the most humble posture, with back bent and hanging tongue.³

The Aino usually carry burdens by means of a braided band of the bark of ohiyo (*Ulmus montana*).

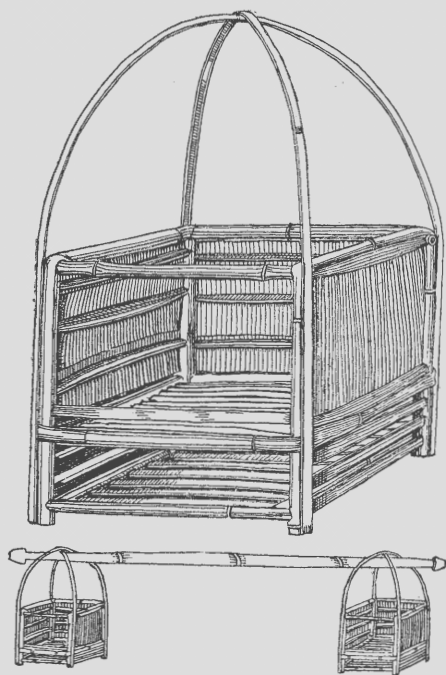


Fig. 123.

CHINESE CARRYING-BASKETS AND SHOULDER-POLE OF BAMBOO.

Cat. No. 74506, U. S. N. M. Gift of the Chinese Centennial Commission, Philadelphia, 1876.

¹ Pokrowski, *Revue d'Ethnographie*, 1889, p. 34.

² Bishop, "Among the Tibetans," Chicago, 1894, p. 44.

³ Bonvalot, "Across Tibet," New York, 1892, Cassell, p. 270.

Example No. 22254 (fig. 126) shows the manner in which this elaborate contrivance is constructed. Hough figures one of them in use (pl. 23), and says that these bands, called tara or pickai-tara, are also employed to sustain the babe upon the back. Sometimes the two ends of the headband are tied to the ends of a stick resting on the lumbar region, and upon this the burden rests. The Korean extends the ends of the stick, and then has a kind of yoke resting on the lower part of his back. The Aino women make constant use of the tara. They carry heavy loads with them, and even bring large tubs of water to their homes.¹

Example No. 22254 is a carrying band collected in Yokohama by the Hon. B. S. Lyman. A similar specimen, collected by Wilkes on the northwest coast of America, is unfortunately labeled Africa.²

Prof. E. S. Morse speaks in the greatest praise of Japanese backs, both as to their strength and flexibility. This people also are expert in the hexagonal weaving of carrying devices in bamboo splints. This enables them to produce a receptacle (fig. 127) which combines perfectly the strength and lightness that are needed. The same hexagonal plan of weaving exists in the U. S. National Museum upon specimens of snowshoes in Canada and cedar-bark wallets of southeastern Alaska and British Columbia, but nowhere on basketry in America south of the Canadian line and east of the coast range.

The Japanese also have borrowed from China the shoulder pole or stick of bamboo for all sorts of short-distance carrying (fig. 128). The exigencies of Japanese commerce do not demand the extensive coolie system. The epoch of the human back, however, was at its climax when the islands were first visited. The people were singularly devoid of beasts of burden. In the figures from life here reproduced the clever tricks for using the pole are made manifest, for in such matters the Japanese are extremely ingenious. Owing to a climate not at all rigorous, the professional carriers are not overclad.

Example No. 73093 (fig. 129) is a carrying frame from the province of Tate Yama, Japan, collected by P. L. Jouy. It is a ladder or frame-

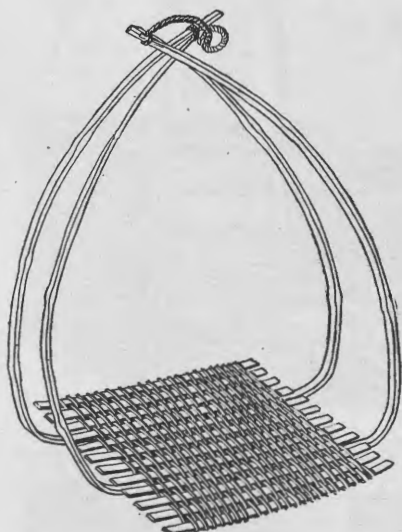


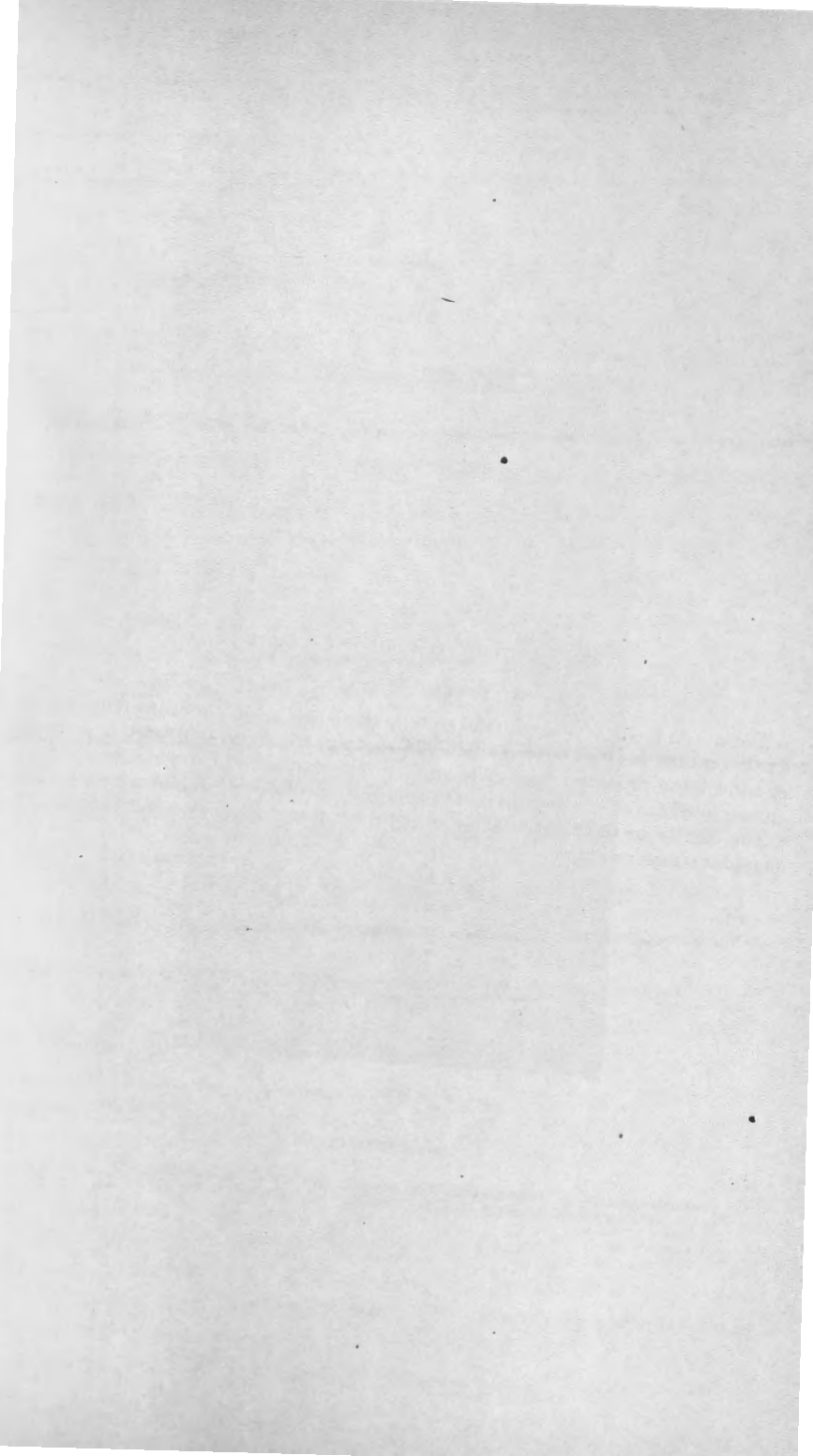
Fig. 124.

CHINESE CARRYING-CRATE.

Cat. No. 54174, U. S. N. M. Gift of the Chinese Centennial Commission, Philadelphia, 1876.

¹ Cf. Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1890, p. 464, pl. cv.

² Cf. Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1887, p. 287, fig. 42.



EXPLANATION OF PLATE 23.

KOREAN PEDDLERS.

The one on the left hand with the rectangular box is a seller of confectionery and small articles, his load resting against his body in front and supported by a strap or band hung from the nape of the neck. This method of carrying is universal among hawkers of small ware, and is said to be omnipresent in Korea.

The carrier to the right wears the knapsack frame supported on the back by shoulder straps or braces.



KOREAN PEDDLERS.

Hough, "The Bernadou, Allen, and Jouy Korean Collections in the U. S. National Museum,"
Pl. VI. Report of the Smithsonian Institution (U. S. National Museum), 1891.

work of wood, not unlike that of some American Indian cradles. To render the framework soft to the back and to hold it in place, it is

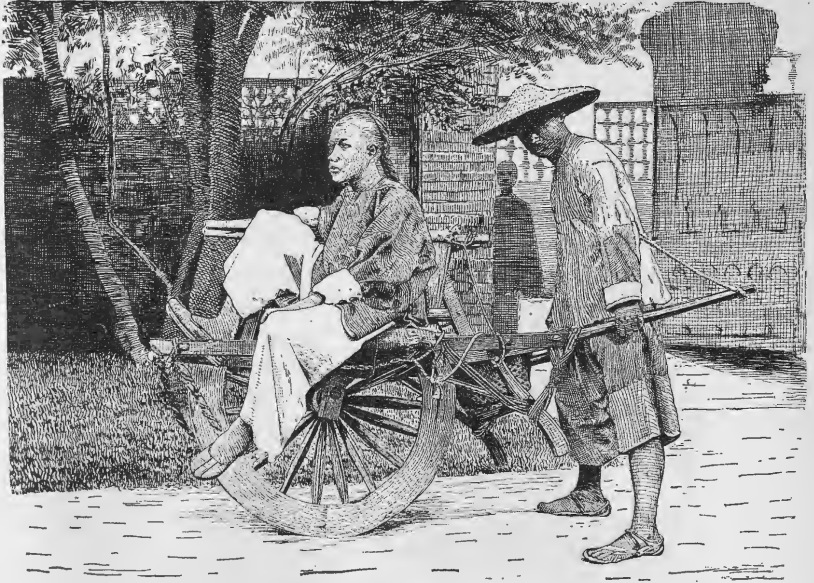


Fig. 125.

CHINESE BARROW OR DOUBLE SHOULDER-PACK, MOUNTED ON A WHEEL.

From a photograph in the U. S. National Museum.

entirely wrapped and concealed in a continuous sennit or braid of straw. The arm bands are of the same material and are braided like

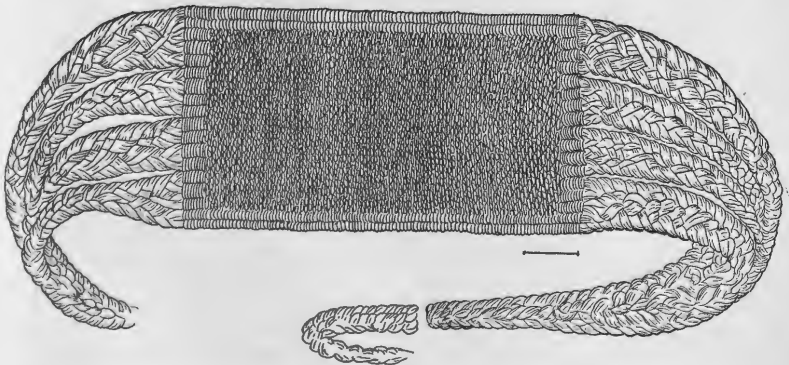


Fig. 126.

JAPANESE HEADBAND AND CARRYING-ROPE, BRAIDED AND WOVEN.

Cat. No. 22254, U. S. N. M. Collected by Hon. B. S. Lyman.

a whip-lash, thickest where the pad is needed. These bands are to be worn knapsack fashion, and are tied by their extremities to the wooden framework. The lashing for the load is also of sennit,

The Tate Yama carrying rack or ladder appears in Korea without the wrapping of sennit, but with pieces framed in near the bottom pointing outward at right angles to form a shelf like that on the glass peddler's frame. A staff or rest may be attached to enable the carrier to relieve his back without setting the burden on the ground. (Fig. 130.) Hitchcock brought from the Aino country photographs of a precisely similar device. It is worn knapsack fashion, which refers the reader to Japan.¹

The carrying pole in Korea (fig. 131) is not always used on the shoulder,



Fig. 127.

JAPANESE CARRYING-BASKET WITH SHOULDER-STRAPS.

Illustration of hexagonal weaving.

From a photograph in the U. S. National Museum.

but after a fashion that recalls two or three inventions in different areas. The pole rests on the lower back and is suspended from a band attached to its middle and passing up under one arm, over the shoulder, back of the neck, down in front of the other shoulder, and back to the starting point. Children in England and America harness one another thus in playing horse; but this is the only example known to the author where the scheme is in serious use. Hooks are suspended from the ends of the pole, and from these hang jars slung neatly in splints. The detachable feature of the sling on the jar is also quite original, as will be noted in Carles's figure.²

From Carles it is also seen that the order of transportation is sometimes reversed in Korea, in that the woman

may carry merchandise on the head and the man become packer for merchandise and passenger-bearer at the same time, using the double bandolier (fig. 132).

Example No. 150768 is a carrying band and seat from Shikotan, in the island of Yezo, collected by Romyn Hitchcock. It is used by women for carrying children on their backs. The apparatus consists of two parts—a woven band which passes over the chest of the bearer,

¹Cf. Carles, "Life in Korea," New York, 1894, Macmillan & Co., p. 67.

²Ibid. p. 30.

to each end of which a line is attached, and a slightly curved wooden seat, to the ends of which the line is made fast. The child sits on the seat as in a swing, and its feet straddle the hips of the mother.¹ (See fig. 133.)

Among the causes that have produced pluck and physical strength in men, perhaps the carrying trade is preeminent. The pick, the hammer, the plane, develop muscle. Art, commercial pursuits, and the enjoyments of life usually render men delicate. The toughening of the legs and back and arms, the development of lung and heart power, and the ability to endure winter's cold as well as summer's heat come from the carrying and traveling industry.

So far we have been in the land of the professional carrier, where men have been compelled to transport burdens and to haul loads professionally.



Fig. 128.

JAPANESE CARRIER, WITH SHOULDER-POLE AND LOADS.

From a photograph in the U. S. National Museum.

Coming to the American continent, the reader will still be witness to a great deal of heavy drudgery in this department, but the human back is greatly relieved by the fact that few of the industries of this continent were in the world's great streams of progress before Columbus, and therefore the amount of burden bearing was restricted to limited culture areas. It is fitting at this point, and speaking of this enormous amount of professional carrying, to take into consideration the effect of this successive work upon the bodies of men.

Dr. Robert Fletcher calls my attention to the fact that studies in this line have been instituted by the French Government upon what is called "l'homme moteur" by Dr. Bezy, of Toulouse. Dr. Fletcher refers

¹ Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1890, p. 426, fig. 67.

to the enormous amount of work done by man power, especially in times of war. It seems that the railroad hands at Toulouse had made complaint of being compelled to carry on the back bags of flour weighing from 100 to 122 kilos (say, 240 pounds) from the car to the quay, a distance of 21 meters, on uneven ground, continuously. One man made twelve trips, but at the last one broke down and was unable afterwards to work.

Dr. Bezy found that the railroad companies had not used the dynamometer in examining men for the work, and, furthermore, the following interesting results were obtained. A man weighing 85 kilos can walk

on a horizontal road at the rate of 1.50 meters per second for a space of ten hours. A traveler with his baggage on his back can carry 40 kilos at the rate of 0.75 meters per second for seven hours. A porter, carrying a load on his back and returning empty handed for a fresh load, can carry 55 kilos at the rate of 0.50 meters per second for six hours.

Dr. Fletcher also calls the author's attention to Quetelet's table of the standard of lifting strength to the rule that a man should not carry a load greater than his own weight.

Excessive carrying is made more injurious by increasing the time, or age, or speed, or roughness of the path, or by decreasing nutrition.

On passing northward into eastern Siberia the student comes upon the pack reindeer, the sledge reindeer, and the dog. Women have their own fashions of carrying children, as will be seen later; but

men are too much burdened with clothing, and relief is too near at hand for them to continue the old-time slavery of the back.

The Eskimo in carrying loads use the band across the forehead as well as across the breast. Having their little hand sledges, they are given more to traction than to carrying. The women have strong backs, and upon them falls the duty of burden-bearing. In the "Cruise of the Corwin" is an account of a woman who, by rolling and the use of her boat, succeeded in transporting an anchor stone weighing, it was supposed, 300 pounds.¹

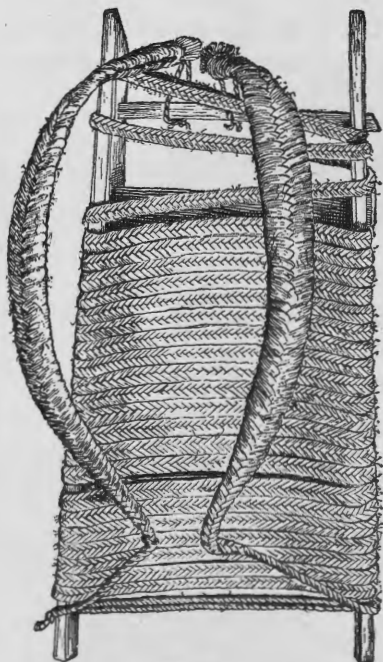


Fig. 129.

NORTHERN JAPANESE CARRYING-FRAME, WITH
SHOULDER-BANDS.

Illustration of plaited work.

Cat. No. 73093, U. S. N. M. Collected by P. L. Jouy.

¹ Haley, "Cruise of the Corwin," Washington, 1885, p. 49.

Turner says that he has seen the Ungava Eskimo place a barrel of flour on their shoulders and carry it up a hillside so steep as to require one not burdened to pick his steps with care.¹

Crantz says that the women of Greenland are the butchers and cooks, and also the carriers to dress the pelts and make clothes, boots, and shoes out of them, and for all this business they use nothing but a knife in form of a half-moon, such as cooks mince meat with, which they use also at the table, and have neither shears nor knife besides; a bone or ivory slice, a thimble, a couple of coarse and fine needles, and their own teeth, with which they pull the skins and supple them both at dressing and sewing. They build and repair the houses and tents quite alone, as far as relates to the masonry. The men very coolly look on while the women bring heavy stones that are ready to break their backs.²

The enormous amount of energy and endurance in the Eskimo arrested the attention of Nansen. He has collected in his second volume a number of narratives in which are described West Greenlanders who have gotten into straits and who have performed prodigies of energy.³

The Babines, a subtribe of carriers in British Columbia, have a frame for the back called tchen-est'lú (sticks interwoven). It is like a rough arm chair without legs, made of stout split sticks of willow (*Salix longifolia*) joined by thongs. The Déné women pack this frame from the forehead with a skin line broadening in the middle, and if the load is heavy the ends of the line are passed across the chest. Father Morice has seen among the Hwotsu' tinne, a fraction of the Babines, a woman thus packing her invalid husband, a man of more than average size and weight.⁴



Fig. 130.

KOREAN BRUSHWOOD CUTTER USING RISING-FRAME WITH SHOULDER-STRAPS.

From a figure in Carles' "Life in Korea."

¹ Turner, "Indians and Eskimo of Ungava," p. 104.

² Crantz, "History of Greenland," London, 1767, p. 164.

³ Nansen, "First Crossing of Greenland," London, 1890, II, p. 285.

⁴ Trans. Canadian Inst., 1894, VII, p. 118.

Example No. 150406 is the model of a similar packing frame (ka-ni-koⁿ-hua) from the Onondaga Iroquois, procured by Mr. Hewitt. It is made of hickory rods bent like a wooden flail, and resembles two backs of bent-wood chairs, one vertical, the other horizontal, the parts united by means of tough hickory bark. The rack for trunks on the back of a country stage coach seems to be a survival of this angular packing frame. Father Morice points out its occurrence in the ancient Mexican codices. It may be seen on the backs of porters at Panama and in Peru. The Patagonian mother has a similar device for her baby, and



Fig. 131.

KOREAN MAN CARRYING WATER BY MEANS OF A POLE RESTING ON THE LUMBAR REGION AND SUPPORTED BY A BAND PASSING OVER THE SHOULDER AND AROUND THE NECK.

From a sketch in the U. S. National Museum.

Hitchcock, as has been said, photographed the type on the backs of his Aino carriers for the U. S. National Museum.

Father Morice reports that the carriers of Stuart Lake (Athapascans) are inferior workmen, and that they fabricate carrying pails from the bark of the birch (*Betula papyracea*) and of spruce (*Abies nigra*). The method of construction is given, with working patterns.¹

Among the carriers the wallet or packing bag of the men, t'lul-en'-kez', is made from the caribou skin cut in fine strips or the skin of beavers when found so decomposed that the fur has lost its value.²

¹ Trans. Canadian Inst., 1894, IV, Chap. VII. The whole paper can not be too highly commended.

² Ibid., 1891, IV, p. 160.

The regular packing wallet (lu'-kéz) of the carriers is made of undressed moose hide and tanned caribou skin. The packing band is of moose skin, broad in the middle for the forehead and quite long. On each end of the wallet is a lug or ear of tanned hide pierced with two holes. The ends of the carrying band pass through the upper holes and are drawn forward and tied across the breast, so that the position of the burden may be changed at will.¹ Salmon skin often replaces the hide. Women are the principal carriers.

Of the Athapascan woman Father Morice says that her capacity for



Fig. 132.

KOREAN METHODS OF CARRYING.

From a figure in Carles' "Life in Korea."

carrying heavy burdens lies in her ability to preserve an accurate balancing of the load rather than in any great muscular strength. The pack rests on the back, between the shoulders, supported by a leather line which passes in a broad band across the forehead and is secured by the ends of the line being tied across the chest.²

The professional carriers about Lake Nipigon, Canada, are described by Ralph, who says that each man uses a tumpline, or long stout strap, which he tied in such a way around what he meant to carry, that a broad part of the strap fitted over the crown of his head (fig. 134).

¹ Trans. Canadian Inst., 1894, iv, p. 147, fig. 135.

² Proc. Canadian Inst., 1889, xxv, Nos. 124 and 152.

Thus they "packed" the goods over the portage, their heads sustaining the loads, and their backs merely steadying them. When one had thrown his burden into place, he trotted off up the trail with springing feet, though the freight was packed so that 100 pounds should form a load. For bravado one carried 200 pounds, and then all the others tried to pack as much, and most of them succeeded. All agreed that one, the smallest and least muscular-looking one among them could carry 400 pounds.¹



Fig. 133.

AINO HEAD-STRAP AND SEAT, FROM SHIKOTAN, YEZO.

From a figure in the Report of the Smithsonian Institution (U. S. National Museum), 1890.

Cat. No. 150768, U. S. N. M.

Mackenzie tells of men who carried seven packages of 90 pounds each across a portage half a league long without stopping.²

The Kutchin woman cuts and hauls the firewood for her husband; she hauls his lodge, kettles, and property when the camp is moved; she hauls the meat to the camp in winter and carries it in summer. During the warm weather she dries the meat, carries him water, makes his clothes, laces his snowshoes, and indeed does all the drudgery of the camps. The men always cook. If a wife will not obey her husband

¹ Julian Ralph, "On Canada's Frontier," New York, 1892, p. 188.

² "Voyages from Montreal through the Continent of North America," p. LVIII.

she gets a good beating. Children are generally well treated by their parents.¹

The watersheds and river systems of Canada and the northern United States, together with the fact that nature supplied excellent material for very light and capacious water craft, rendered this whole territory accessible from any point of it and made it possible for single stocks of Indians to occupy large territory. Portages were of several kinds:

(1) The voyageurs unloaded their canoes, carried the goods on their backs by means of headbands or on their shoulders. from open water to open water, making as many trips backward and forward as necessary. The canoe was towed up and past the obstruction by means of strong lines.

(2) If the water would not permit the towing of the boat, it had to be carried around the obstruction, a distance of a few feet or of miles. In fact, in former time this sort of carrying was called portage, the carrying of goods alone was called *décharge*.

(3) In descending, the boat with its cargo, or partly lightened, was "shot" through moderate rapids by skillful steersmen, or let down by means of lines and guided past dangerous points.

Portages varied also in their length, in the nature of the surrounding hills, in the depths of the water according to season. Mackenzie speaks of portage à la vase, which is the same as the English mud portage, or the poling, dragging, forcing of the vessel through mud flats. Now and then a natural canal was helpful, and then for a quarter of a mile or more the navigation was a comprehensive example of all the species of human effort.²

Of his carriers Mackenzie says that when leaving Montreal they arrived at the Grand Portage, which is 9 miles over; each of them had to carry 8 packages (90 pounds). "So inured are they to this kind of labor, that I have known them to set off with two packages and return with two others of the same weight in six hours, a distance of 18 miles over hills and mountains."

The canoes of the Hudson Bay Company were navigated by four to six men, and carried on an average 3,500 pounds. Each had a foreman



Fig. 134.

CANADIAN PACKER WITH TUMPLINE.

From a figure in "Canada's Frontier," by Julian Ralph.

¹ Jones, Rep. Smithsonian Inst., 1866, p. 326.

² Mackenzie, "Voyages from Montreal through the Continent of North America," Philadelphia 1802, p. xxxiii.

and a steersman, and enough additional men to form a crew capable of carrying the boat.

The justification among the Chippewas for loading the backs of their women with grievous burdens is found in their mythology. They derive their origin from dogs. At one time, as the story goes, they were seized with such reverence for their canine ancestors that they entirely ceased

to employ dogs in drawing their sledges, greatly to the hardship of their women, to whom the task fell.¹

Maximilian saw Cree Indian women returning in all directions from the forests, panting under the weight of large bundles of wood, which were fastened on their backs.²

Example No. 165918 in the U. S. National Museum is the universal packing or parfleche case of the Cheyenne Indians of the Algonquian stock. It is made from a single piece of buffalo hide, cured as rawhide and nontawed. A hide was first sweated so that the hair would come out and then cleaned and stretched until nearly dry. It was then cut into shape, doubled up into wallet form, useless folds were cut away, and was then fitted with strings and painted in green, black, yellow, and blue to the gentile pattern. The U. S. National

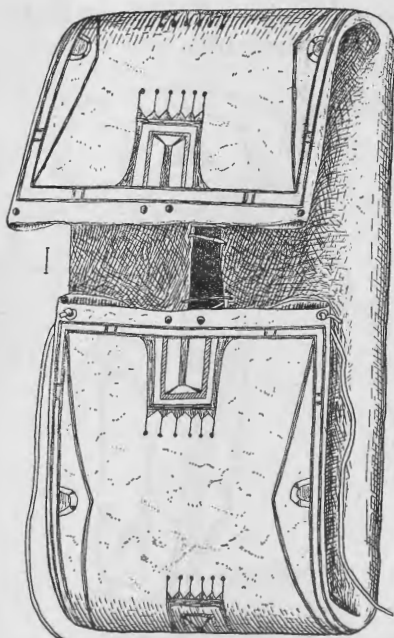


Fig. 135.

RAWHIDE PACKING OR PARFLECHE CASE.

Cat. No. 165918, U. S. N. M. Collected by H. R. Voth.

Museum possesses a large variety of these packing cases from every one of the stocks on the plains—Siouan, Algonquian, Caddoan, Kiowan, and Shoshonean.

The function of the parfleche was to preserve articles and food in the tent and to become a packing case for man, for dog's back, dog travois, horse travois, and horse's back in the daily or the annual move (figs. 135 and 136).

"In winter time," says Wood, "the New England Indian women were their husbands' caterers, trudging to the clam banks for their timber, and their porters to lug home their venison which their laziness exposes to the wolves till they impose it upon their wives' shoulders."³

Loskiel says that the Delaware women carried everything on their

¹Bancroft, "Native Races of the Pacific States," New York, 1874-1876, 1, p. 118.

²Maximilian, "Travels in the Interior of North America," London, 1843, p. 203.

³Wood, "New England's Prospect," Prince Soc. Publications, Boston, 1, p. 108.

heads, fastened by a thong round their foreheads. By means of this they frequently supported above a hundredweight, the load being placed so as to rest also upon their backs.¹

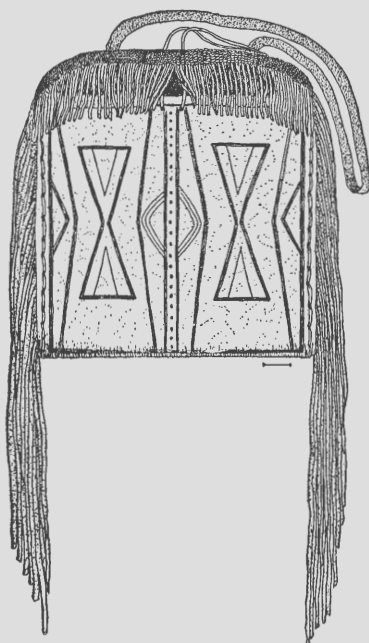
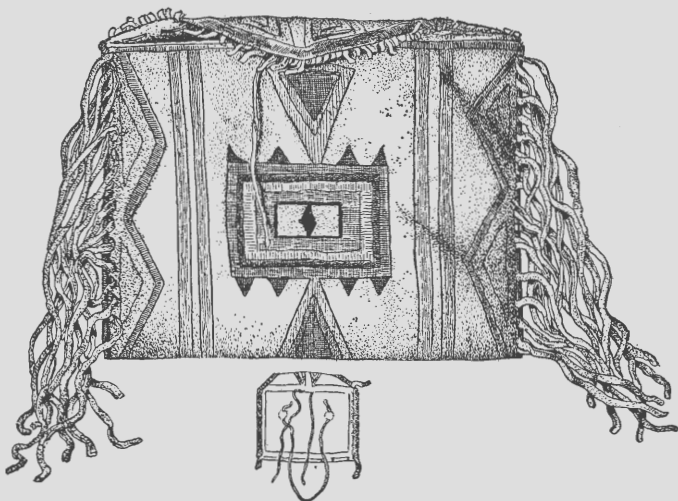


Fig. 136.

RAWHIDE PACKING OR PARFLECHE CASES.

Cat. No. 165129, U. S. N. M. Collected by James Mooney.

The U. S. National Museum possesses an old carrying basket, example

¹Loskiel, "History of the Mission of the United Brethren," 1794, pp. 107-108.

No. 8430 (fig. 137), from the Arikaree Indians, of Dakota, who are of the Pánian or Caddoan stock. The basket is quadrilateral, widest at the top and longer than wide. Four bent poles constitute the frame, each one forming the basis of a side or end. The end ones, much like ox-yoke bows, project below the others to form a rest for the basket. At the top the ends of the poles are held in place by means of a hoop. In a former paper the weaving was said to resemble that of the British Columbia tribes in cedar bark and other flat material, and so it does. But it is

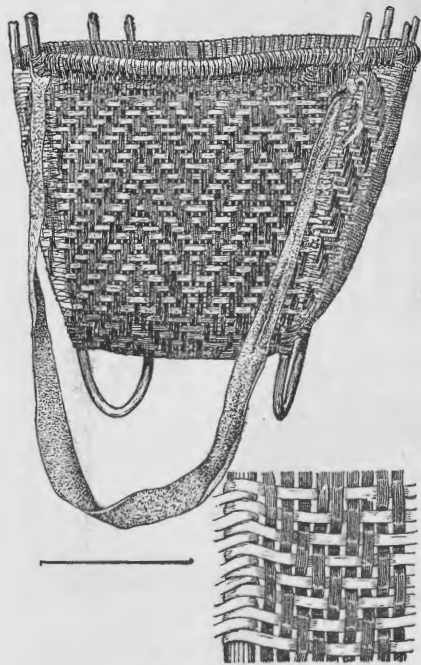


Fig. 137.

CARRYING-BASKET OF ARIKAREE (CADDOAN) INDIANS.

Cat. No. 8430, U. S. N. M. Collected by Dr. Washington Matthews, U. S. A.

more significant here that it also resembles that of the Muskogean and other southern stocks of the United States. It is diagonal weaving in narrow strips of birch and other tough bark, varying in color. The distribution of this type of weaving belongs to the study of the industries of the American aborigines.

The cacique of Patofa gave to Soto guides, 700 Indians to bear burdens, and maize for four days' journey. Soto traveled six days by a path, which narrowed more and more until it was lost altogether. All through Georgia the Indians obeyed their ladie to furnish bearers. From that it is inferred that the professional carrier had been developed.¹

Example No. 91508 (fig. 138) is a form of carrying basket quite common among the Choctaw

Indians of Louisiana. It is a hamper holding a bushel or more, wider at top than at bottom. It is made of the common cane, split and woven by diagonal weaving, the universal method among the southern tribes of the United States upon all baskets whatever. The headband of leather is attached to the sides of the basket.

On the west coast of America, south of the peninsula of Alaska, the sled, the kayak, and the portable canoe disappear, and the porter at once assumes his carrying devices, and does not lay them aside again until the Straits of Magellan are reached. Both head and breast band are brought into play. With the former the reader is familiar.

The breastband is a flat piece of textile or hide extending from a

¹ "Discovery and Conquest of Terra Florida," Publications of the Hakluyt Society 1851, p. 52.

load on a man's back across his arms and breast. Sometimes it is seen quite up to the collar bone, again it crosses almost down to the elbows. A good picture of this device is given by Krause. He figures a Chilkat man, barefoot, wearing trousers and blouse, and carrying a pack supported by a headband and breastband. Between the former and the forehead lies a soft pad.¹ (Fig. 139.)

Schwatka was astonished at the endurance of the Alaskan carriers, and says that the Indian packers over these mountain passes usually carry 100 pounds, although one he had witnessed walked along readily with 127, and a miner informed him that his party employed one that carried 160. The cost of carriage of a pack (100 pounds) over the Chilkoot trail for miners has been from \$9 to \$12, and the Indians were not inclined to see him over at any reduced rates, despite the large amount of material required to be transported, some 2 tons. By giving them two loads, or doubling the time over the portage, a slight reduction could be had, not worth the time lost in such an arrangement, and he made contracts with enough of them to carry his effects over at once. "Mr. Spuhn was also very energetic in his efforts to secure for me better terms, but without avail, and after I crossed the trail I in no way blamed the Indians for their stubbornness in maintaining what seemed at first sight to be exorbitant, and only wondered that they would do this extremely fatiguing labor so reasonably."

Schwatka gives a view on Payer portage, representing a Chilkat Indian with two ammunition boxes going over the pass. The amount some of these packers will carry seems marvelous, and makes estimates for pack mules or trails therefor seem superfluous. Their only packing gear is a couple of bands, one passing over the forehead where it is flattened out into a broad strip, and the other over the arms and across the breast. The two meet behind on a level with the shoulder, and are there attached to lashings more or less intricate,

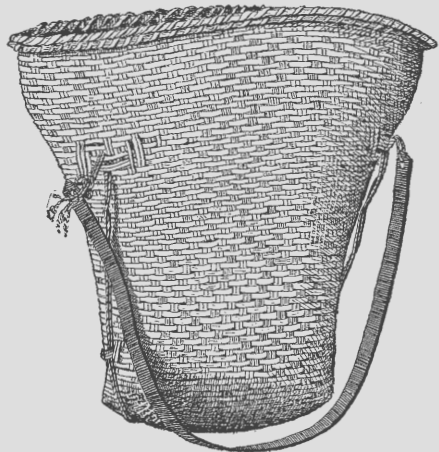


Fig. 138.

CHOCTAW CARRYING-BASKET, COMMON AMONG MUSKHOGEAN TRIBES.

Cat. No. 91508, U. S. N. M. Collected by Edward Palmer.

¹ Aurel Krause, "Die Tlinket-Indianer," Jena, 1885, p. 101.

according to the nature of the material to be transported. If a box or stiff bag, the breast band is so arranged in regard to length that when the elbow is placed against it (the box), the strip fits tightly over the extended forearm across the palm of the hand bent backward. The head-band is then the width of the hand beyond this. Schwatka saw a few Indians arranging their packs and their harness according to this mode. The harness proper will not weigh over a pound, and the lashing according to its length. The strip across the head and breast is of untanned deerskin, about 2 inches wide, with holes or slits in the ends protected from tearing out by spindles of bone or ivory.¹



Fig. 139.

CHILKAT (KOLUSCHAN) PACKER
WITH LOAD.

From a figure in "Die Tlinket Indianer," by Krause.

"It seemed marvelous beyond measure how these small Indians, not averaging, I believe, over 140 pounds each, could carry 100 pounds up such a precipitous mountain, alternately on steeply inclined glacial snow and treacherous rounded bowlders where a misstep in many places could have hurled them hundreds of feet down the slope or precipices.

"The Indian would chase a goat, almost keeping up with him, down into the valley where we camped, and up the steep mountain slopes of the eastern side equally as high as those mentioned, and all this immediately after he had carried over 100 pounds across the trail."²

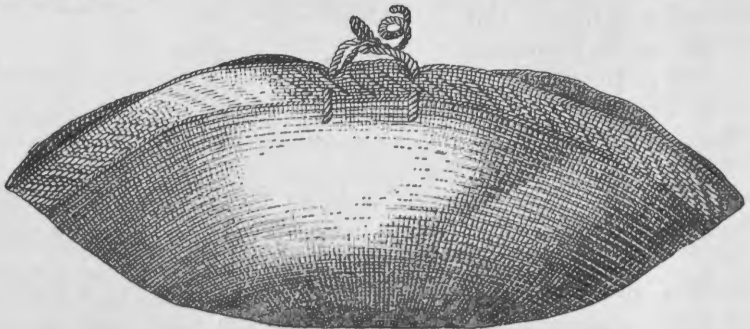


Fig. 140.

CARRYING-WALLET OF SPRUCE ROOT, MIXED PLAIN AND TWINED WEAVING.

Southeastern Alaska.

Cat. No. 168163, U. S. N. M. Collected by Herbert Ogden.

Example No. 168163 (fig. 140) is a wallet of spruce root from southeastern Alaska, near Fort Wrangell. It is a shallow bowl or tray,

¹Schwatka, "Military Reconnoissance in Alaska," 1883, p. 23, fig. 8.

²Ibid., pp. 17-18.

circular in outline, and flexible. The noteworthy characteristic is the mixture of art in its production. In the webt every alternate row is twined and the next plainly woven. Now Dixons Entrance is the point of contact of the Koluschan or Tlingit, the Skittagetan or Haida, the Chimmesyan and the Wakashan or Haeltzukan families, and Salishan tribes are not far distant. On the north of Dixons Entrance twined weaving in split spruce root attains its perfection. On the south of it, in the cedar-bark country, plain weaving and diagonal or diaper weaving have their development. In this specimen a Tlingit woman might have woven one row and a Wakashan woman the alternate row. On a great many trade baskets and fanciful articles, such as covered bottles, this alternation reappears. The handle is a loop of spruce-root rope on one margin and a loose end on the other margin to fit therein.

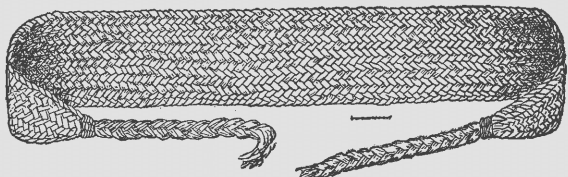


Fig. 141.

PLAITED CARRYING-BAND AND LINE, USED BY THE MAKAH (WAKASHAN) INDIANS, NEAH BAY, WASHINGTON.

Cat. No. 1292, U. S. N. M. Collected by James G. Swan.

Speaking of the necessity of carriers from the coast, Seton-Karr says that when the Chilkats are all gone, those interior regions which are only attainable on foot with pack-carriers or packers will become

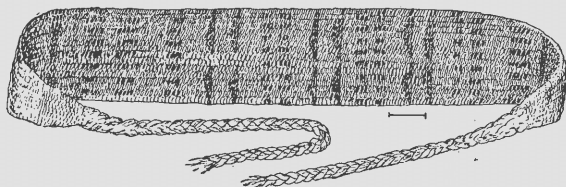


Fig. 142.

PLAITED AND WOVEN HEAD-BAND, USED BY THE CLALLAM (SALISHAN) INDIANS.

Cat. No. 23472, U. S. N. M. Collected by James G. Swan.

more difficult of access, because now these Indians, broken as they are by disease, can yet carry heavier packs than a white man. They can travel farther on foot and endure greater hardships. They do not require so much in the shape of clothes and bedding. Their dried salmon, which they carry as food, weighs little, and they are satisfied with that. They are able, moreover, to supplement this with many kinds of roots, herbs, and fruits which are eatable.¹

Mrs. Allison says of the Similkameen:

Before there was any regular means of transport over the mountains lying between Hope, on the Frazer, and the Similkameen, the Indians used to be employed to pack provisions over on their backs. Their packs were suspended by means of a band or strap passed over their foreheads [see figs. 141 and 142], and I have known some of them to pack three sacks of flour (150 pounds) on their back while traveling on snowshoes for a distance of 65 miles over a rough, mountainous road, with a depth of 25 feet of snow on the summit of the Hope Mountain, over which the trail ran. Some-

¹Seton-Karr, Proc. Roy. Geog. Soc., London, 1891, XIII, p. 73.

times a whole family would start out on one of these packing expeditions, the children as well as their parents, each taking a load and accomplishing the journey in six or eight days, according to the state of the road. If an unusually violent snowstorm overtook an Indian while traveling in the mountains he would dig a hole in the snow, cover himself with his blanket, and allow himself to be snowed up; here he would calmly sleep until the snow had passed, then he would proceed on his journey.¹

Mayne's testimony is to the same effect:

The things were then divided into bundles or packs, of as even weight as possible, giving some 50 or 60 pounds to each man. Arranging these packs is a matter of no little difficulty, for the Indian has a great objection to altering his load after he has started, so that you have to give the men carrying the provisions, which grow lighter daily, a heavier load at starting than those who have the canteen or the tent to carry.

They generally stop for some five minutes' rest every half hour. This they do with surprising regularity. They generally squat near a ledge of rock on which they can rest their burden without removing it. They carry everything the same way, viz, with a band over the forehead, the pack resting on their shoulder blades or a little below.²

Of the Columbia Indians Lewis and Clark speak:

The morning was cool; the wind high, from the northeast. The Indians who arrived last night took their empty canoes on their shoulders and carried them below the great shoot, where they put them in the water and brought them down the rapid, till at the distance of $3\frac{1}{2}$ miles they stopped to take in their loading, which they had been afraid to trust in the last rapid, and had therefore carried by land from the head of the shoot.³

The men and women about Stillwater, Mont., carry loads in a similar way. (Fig. 143.) The packer takes a reata or rope about the size of one's finger, made out of Buffalo skin or braided elk skin (three plait), lays it on the ground in shape of a loop, and places the load across it. They generally get a little rise in the ground or a cut bank; but if on the level of a prairie they are helped by one of their number to raise it or else work over on their side until they can get upon their knees, when they are all right. After placing their load of 100 pounds each of flour or a quarter of a buffalo or steer or a bundle of dry wood they, with their back against it, take the curve or bend of the rope over their head,



Fig. 143.

INDIAN WOMAN CARRYING WOOD WITH BREAST-BAND AND PARBUCKLE.
Montana.

From a photograph in U. S. National Museum.

¹Allison, Journ. Anthropol. Inst., London, 1892, xx1, pp. 305-306.

²Mayne, "British Columbia and Vancouver Island," pp. 100-101.

³"History of the Expedition under the command of Lewis and Clark," New York, 1893, II, p. 684.

down across the breast and across the shoulders, and then, taking one of the ends in each hand, bring them up behind their back, catch the rope on top of the load by running each end under; then, pulling the ends over each shoulder, tighten the load, if loose, and then raise on one side, then the other, to make it more secure, and with a heave forward the carrier comes to the knees before getting on the feet. The load or burden rests on the back and shoulders. When moving, the body is bent forward, and the heavier the load the more the body is inclined. I have seen them carry wood over 4 miles in this way, resting whenever they find a suitable place, like a cut bank or washed gully, so the load will be even with the place and can be taken again in a minute or so.

It will be observed that the regulation carrying strap is for the professional packer. When good textiles abound along the shores and inland, from Sitka southward, the carrying wallet and conical basket come into vogue. In the land of the giant cedar and of the soft grasses the former prevails. Under the domination of more rigid material the cone comes into play. The freight also is different. Most of the dwellings of the fishing people are by the water side, the freight can not be packed and the haul is short:

Example No. 127843 (fig. 144) is a carrying wallet from the Quinaielt Indians, a Salishan tribe in Chehalis County, Wash., collected by Charles Willoughby. By reference to the illustration it will be seen that the apparatus is a combination of the head band and line, a kind of inverted sling, with a bag. The band is braided in the same manner as in the foregoing figure.

The construction of the wallet is of interest. The general texture is precisely that of the typical Chilkat blanket and the Sitka wallets, only the material is twine, the weaving is loose and flexible, and the warp is horizontal. At the top are one or two interesting features introduced to strengthen the border. Two rows of close-twined weaving are laid on outside as in the style called "bird-cage" stitch. The

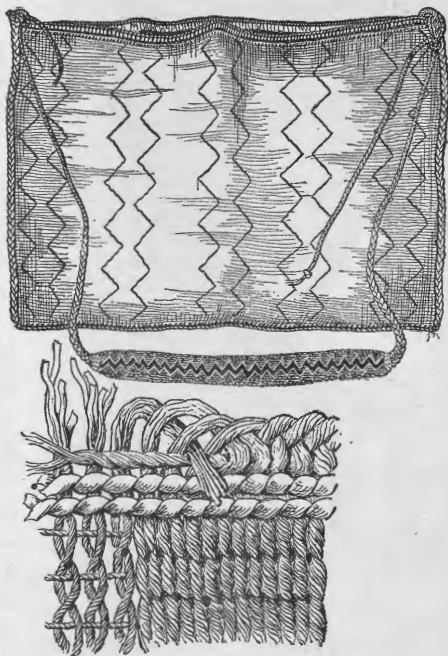


Fig. 144.

CARRYING-WALLET AND HEAD-BAND.

An example of twined weaving, with horizontal warp.
Cat. No. 127843, U. S. N. M. Quinaielt (Salishan) Indians, Washington.
Collected by Charles Willoughby.

ends of the weft are braided down into one another, drawn tight and cut off.

Example No. 19026 (fig. 145) is a conical carrying basket used by the Clallam Indians. It was collected by James G. Swan. It is introduced to show how the savage inventor would convert a soft wallet of the north into a hard cone of the south. The web of the basket is from rushes united by twine weaving, by braiding, and by the plaiting of a single filament. This soft, open network is converted into a light but strong cone by the insertion of a hoop into the top and the fixing of

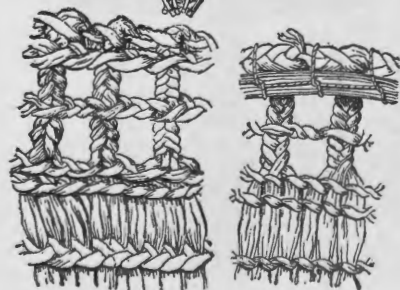
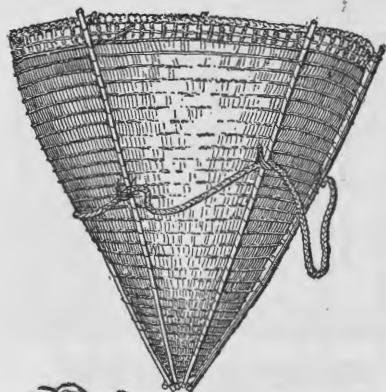


Fig. 145.

CONICAL CARRYING-BASKET WITH RODS AND PLAITED HEAD-BAND FROM PYRAMID LAKE, NEVADA.

Cal. No. 19026, U. S. N. M. Collected by Stephen Powers.

six vertical rods to the hoop at equal distances, uniting their ends at the bottom of the cone, and sewing them to the texture of the wallet inside.

Example No. 19289 (fig. 146) is a burden basket used by McCloud River Indians, California, collected by Livingstone Stone. In the Clallam basket just noted, the headband encircles the cone about the middle, raising the load high on the back, after the manner of the Oriental water carriers. Indeed, the conical basket and the conical jar should be studied together as for the back instead of the head. Farther south it will be seen that the Pueblo women make their jars for the head, while the Papago make theirs for the back, hence the variety in form. (Fig. 146.)

The California woman has abundance of rhus, hazel, willow, pine root, and other rigid material and may decorate the surface with different fern stems, straw, and dyed splint. So she makes her baskets in twined weaving, having rigid switches or small stems for her warp. But in this central California region there is a device of strengthening the texture not sufficiently explained in the drawing. It is, in fact, the union of what has been called the twined stitch with the bird-cage stitch.

There are three elements: (1) The fundamental or vertical warp of twigs; (2) across this at right angles a horizontal subsidiary warp of twig carried around in the process of weaving, and (3) a web or weft of twined weaving uniting the two. Dr. Hudson, of Yokai, Cal., the

best authority on such matters, draws attention to the fact that all the northern stitches culminate in the Sacramento Valley and parts adjacent, and that the Yokaian stock are very adept at this composite style of texture. The top of this basket is strengthened by a hoop, to which the carrying band is attached. The bottom is strengthened by close weaving.

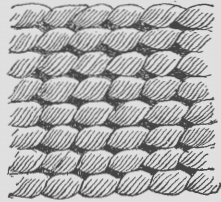


Fig. 146.

CONICAL BURDEN-BASKET USED BY THE MCLLOUD RIVER INDIANS OF SHASTA COUNTY, CALIFORNIA.

Cat. No. 19289, U. S. N. M. Collected by Livingston Stone.

The Pomo Indians use a conical basket for carrying, held on the back in a sling, the headband of which passes over the carrier's brow. Dr. Hudson once saw an old woman carry 3 bushels of potatoes in this manner through mud and rain to her home 2 miles distant. Greater loads are not unusual to the men, and as a consequent result of such customary labor the Digger Indian is abnormally developed in the dorsal and the anterior cervical muscles, besides having a chest magnificent in proportions.¹

Example No. 126907 (fig. 147) is an elaborately constructed headband worn by the Natano band of Hupa Indians, Athapascan stock, living on the reservation of the same name in northern California. It consists of a loosely woven, visor-like pad to fit on the forehead, and is held in place by a rope made of the warp of the pad, served with twine made from the native hemp. This apparatus is first placed on the head, and then the headband of the load or of the tracking line is worn over it. It must be remembered that the Hupa are the kinfolds of the Carrier

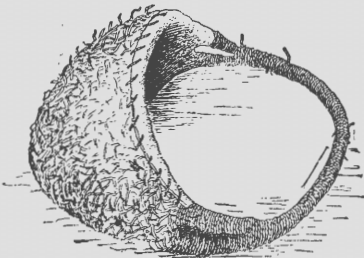


Fig. 147.

FOREHEAD PAD WORN BY THE HUPA (ATHAPASCAN) INDIANS OF CALIFORNIA.

Cat. No. 126907, U. S. N. M. Collected by Capt. P. H. Ray, U. S. A.

Indians of Canada and Alaska. Collected by Capt. P. H. Ray, U. S. A.

Farther southward and in the mountains north of San Francisco Bay

¹ J. W. Hudson, *Overland Monthly*, 1893, XXI, p. 573.

dwell the most exquisite of American basket makers. They use the conical carrying basket, and from each of the stocks the U. S. National Museum has a large collection. They also make globular baskets in large quantity and of many sizes, but these are quiet holders of things, not carriers. If they were they would sit on the head after the manner of a Zuñi vase.

In the companion pictures here given (figs. 148 and 149) the two styles of weaving are shown, the open and the close, though both have



Fig. 148.

POMO WOMAN CARRYING CONICAL BASKET.
California.

From a photograph in the U. S. National Museum by H. W. Henshaw.



Fig. 149.

YOKAIIA MAN CARRYING WOOD IN CONICAL BASKET.
California.

From a photograph in the U. S. National Museum by H. W. Henshaw.

the same stitch. In the administration and mingling of the twine and the coil the natives of central California developed as many as seven distinct varieties of weaving, which will be minutely described in a paper on the industrial arts of the aboriginal Americans. The man is a Yokaiia, reduced to poverty by the new régime, and is seen carrying wood. The staff is of great help to the bearer with the headband. The other picture represents a Pomo woman bearing a lighter load in a conical basket. The headband encircles the middle of the utensil, and passes across the woman's forehead well up. The basket is woven

by the twined process, and ornamented in bands and triangles with split stems of maidenhair fern.

Example No. 42155 (fig. 150) is one of a large number collected among the Utes of Utah by Maj. J. W. Powell. The Utes belong to the Shoshonean stock, stretching from the northern border of Mexico to Costa Rica. In each culture area they will be found adapting themselves to circumstances and yet preserving their originality:

(1) In the north they carry luggage in folders or cases of rawhide, as do the Sioux and other dependents on the buffalo.

(2) In the Great Interior Basin, of which they were practically the owners in aboriginal days, the Ute-Shoshoneans were gleaners of all sorts of grass seeds; the women went out with conical baskets, stood them on the point behind a bunch of goose foot or other plant, with a fan knocked the seeds into the cone until it was full, hung the load on their backs by means of the headband, and carried it home. The contents were winnowed, ground, and cooked by the same industrious women.

(3) In the pueblo country the Utes are represented by the mixed Moki pueblo, where, as will be seen, four or five quite distinct types of carrying baskets are made.

(4) In Mexico and southward the Aztecan becomes the greatest of burden bearers.

The cones here described are made of split osiers, rhus stems, and the scions of other plants not identified, worked into twined weaving, leaving a very rough surface on account of the harshness of the material. Once in a while a narrow band of black varies the monotony. But nothing is more striking in the immense Powell collection of Ute material than the lack of variety in the color of the buckskin clothing and the uniform hue and texture of the carrying baskets and bottles.

Examples Nos. 131139 and 18897 (figs. 151 and 152) are carrying nets from the Missions in California. The latter is marked Temecula, who are Shoshonean; the former is simply accredited to the Missions. In the Powell collection from Utah is another carrying net, No. 11244. Each of these is a strip of open netting with fixed meshes, gathered up at the

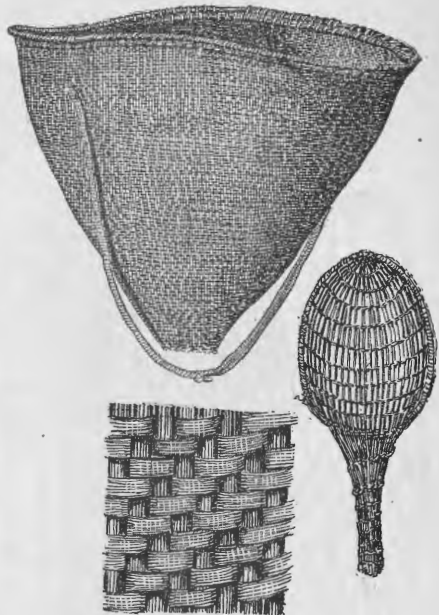


Fig. 150.

UTE SEED-BASKET AND GATHERING-FAN.

Cat. No. 42155, U. S. N. M. Collected by Maj. J. W. Powell.

ends into an eyelet or loop like a hammock and provided with a carrying rope of the same kind. The nets are of bast fiber, probably *Apocynum*. The knots of two of them are the standard-mesh knot, bowline on a bight, in nautical phrase; the other is square. The geographic distribution of knots will be considered later, but the reader practically bids adieu to the rigid mesh knot with the Pueblo region and takes up the plain coil, half-hitch, wrapped filament of all America south. This is seen in carrying nets and hammocks.¹

Before leaving the Shoshonean sphere of influence, it is necessary to

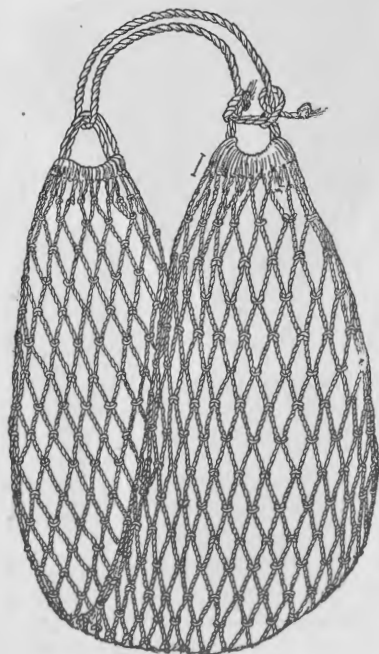


Fig. 151.

CARRYING-NET USED BY THE MISSION INDIANS OF CALIFORNIA.

Cat. No. 131139, U. S. N. M. Collected by Stephen James.

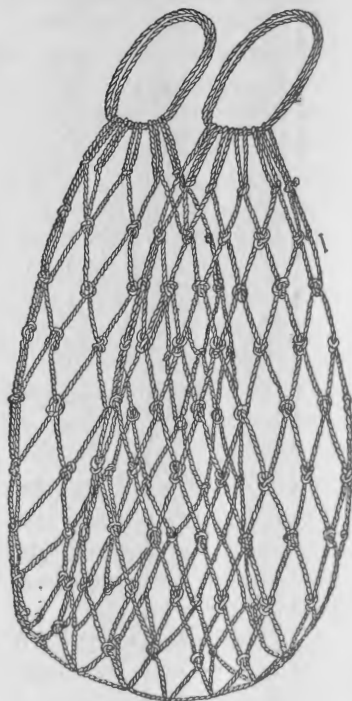


Fig. 152.

CARRYING-NET MADE OF AGAVE FIBER, USED BY THE TEMECULA INDIANS OF CALIFORNIA.

Cat. No. 18907, U. S. N. M. Collected by Edward Palmer.

mention another carrying device whose texture and material are the same as that of the Ute conical burden basket. Example No. 42129 is one of a large number of tight carrying bottles or jars, used in the transportation of water. After being closely woven the vessel is dipped in hot pitch, and this closes every chink. These vessels are much stronger than pottery; indeed, it seems impossible to break one in the ordinary wear and tear. In the course of the weaving lugs or loops are left on the side for the carrying band. These water bottles in their

¹ Cf. Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1887, p. 369, fig. 75.

use are not confined to the Utes, being seen in the hands of Apaches and Pueblo peoples. The Apaches are Athapascans, and are most expert in coiled basket bowl weaving. It is fair to infer that they possess this type of water jar by trade or that they were early taught the art of making them in their new homes.¹ (Fig. 153.)

Davis speaks of Indian women carrying water along on the march for the Spaniards to drink.²

Vaca says of the Arbadaos, a tribe of Indians in western Texas, that they go naked, and tear their flesh in passing through the woods and



Fig. 153.

APACHE WOMAN CARRYING WATER IN BASKET BOTTLE.

From a photograph in the U. S. National Museum.

bushes. They were obliged to carry heavy loads of wood upon their backs, and the cords which bound it on cut into their flesh. This refers to Vaca's party³ in this instance, but shows the common method of carrying in this region.

Vaca also speaks of a separate class of emasculated men among some

¹Cf. Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1887, p. 268, fig. 14. Apache woman carrying water bottle.

²"Spanish Conquest of New Mexico," Doylestown, 1869, p. 89.

³Ibid., p. 77.

Texan tribes who, among other functions, carried heavy burdens. They were more muscular and taller than other men and bore burdens of great weight.¹

The Apaches also use a modified conical basket, example No. 21489 (fig. 154). The material and the stitch are precisely those of the Utes, but there are three noticeable features. The basket is oblong, like a northern pack; the surface is decorated by plain colored and checkered bands, and hanging from the top and the bottom are fringes of buckskin, at the ends of which are the false hoofs of deer and bits of tin rolled up.

The reader is now in the midst of the arid region including the cliff



Fig. 154.

ORNAMENTED CARRYING-BASKET USED BY THE APACHE INDIANS OF ARIZONA.

Cat. No. 21489, U. S. N. M. Collected by J. B. White.

dwellings and the pueblos. Into it have come tribes from the four quarters and introduced every form of carrying apparatus known thereabout. They also preserve to us forms obsolete elsewhere. In addition to this, for three hundred and fifty years, Spanish influence has been at work producing modifications and making additions. The women who go to the mesa for clay now bring it home in old blankets in good European style, slung over one shoulder like a peddler's pack. Mr. Cosmos Mindeleff calls the attention of the writer to a curious shifting of the industrial center in those pueblos where the men collect wood in the adjoining plains, carry it by toilsome journeys up the mesas just to burn it for the ashes. The creating of fires in the plain would disturb all the

social economy of the mixed populations.

The Moki or Hopi pueblos, seven in number, in northeastern Arizona, have been carefully studied by many ethnologists, latterly by the Bureau of Ethnology and by Dr. J. Walter Fewkes. These tribes, of mixed linguistic affinity, have several marked varieties of basketry, especially for carrying: (1) wickerwork, warp rigid, weft flexed; (2) diagonal weaving, of split yucca leaf; (3) coiled work, in meal plaques, etc.; (4) twined work, in water jars.

Example No. 70937 (fig. 155) is one of a large number of carrying baskets from Moki in wickerwork, the same manipulation being practiced on pretty plaques and flat, quadrilateral mats. The material is the unbarked twigs of little shrubs yet undetermined. The

¹ Davis, "Spanish Conquest of New Mexico," Doylestown, 1869, p. 83.

quadrilateral form and framework of these baskets recall the Arikaree specimen before described. The headband is attached to the ends one-third of the distance from the top.

Example No. 42153 is figured by Stevenson, in connection with a plaque having woven center and wicker border.¹

Example No. 42199 (fig. 156) is a carrying basket of split yucca fiber leaf in diagonal weaving, collected by James Stevenson. There are a great many specimens of this ware in the U. S. National Museum varying in form from a flat tray to a deep fruit-picking basket. All of them are coarse, light, strong, and often made to be quite ornamental by the variation of the stitch and alternating of the two sides of the leaf, one green and the other whitish. The headband is attached to the rim. The various styles are figured by Colonel Stevenson.²

Example No. 42129 (fig. 157) is a water-tight jar for carrying water, collected at Wolpi, one of the Moki pueblos in northeastern Arizona, by James Stevenson. It is of split

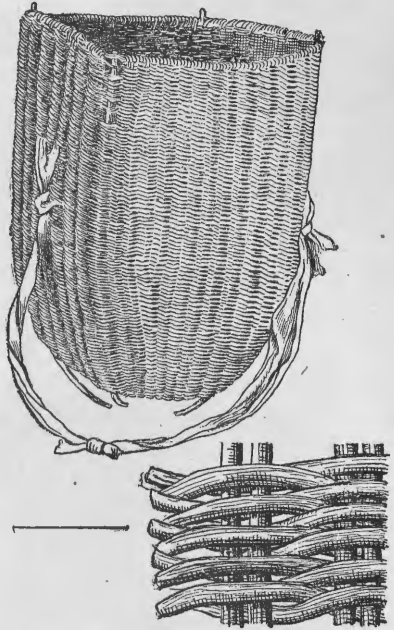


Fig. 155.

FRUIT-PICKER'S BASKET FROM TUSAYAN, ARIZONA.
Cat. No. 70937, U. S. N. M. Collected by James Stevenson.

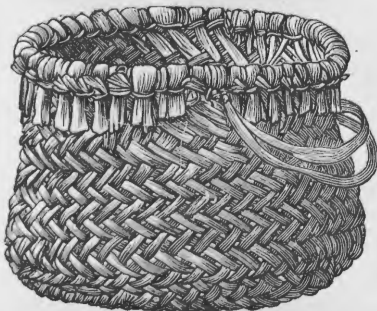


Fig. 156.

BASKET FOR GATHERING YUCCA FRUIT, FROM TUSAYAN, ARIZONA.

Cat. No. 42199, U. S. N. M. Collected by James Stevenson.
From a figure in the Second Annual Report of the Bureau of Ethnology.

osiers made in coiled work, after the fashion of the Apache trays, and dipped in hot pitch. Lugs of horse-hair are attached to the sides for the headband. This should be compared with Ute and Apache specimens, the more especially since these make no pottery, while the Moki are excellent potters.

The basketry of the Zuñi Indians, in New Mexico, as it exists in the U. S. National Museum is of very rude and ordinary form, doubtless owing to poverty of material and motive to its construction. The twined, coiled wicker, and diagonal or plaited styles exist,

but no original fashions are developed.

¹ Second Ann. Rep. Bureau of Ethnology, figs. 539, 540.

² *Ibid.*, figs. 543-545.

Example No. 22971 (fig. 158), collected by James Stevenson, is built up on corner bows and warp of three sticks together; the filling is in wicker and the ends are fastened off very neatly by tucking them in.¹

Example No. 40093 (fig. 159) is a modern specimen of Moki pottery collected by James Stevenson; and is one of a large number illustrating the control of the carrying function over form. It may be called an aboriginal canteen and could have been influenced in shape by those of civilized peoples. At any rate, the mouth has relation to filling and emptying, the flat side to the convenience of the carrier; the lugs are for the headband, for the Moki wears the canteen on the back and not on the hip with the strap over the shoulder. Finally, the whole motive

of ornamentation is controlled by the industrial form. The axis of ornament has revolved outward 90 degrees from the mouth to the apex of the outer side. In the great variety of canteens figured by Stevenson this is true.²

Water jars, globose in form, with wide open mouths and receding bottoms to fit the carrier's head (fig. 160), exist by thousands in Zuñi and other pueblos.³

Carrying on the head is not an American Indian native custom. There are thousands of Pueblo water pots and jars with concave bottoms to facilitate carrying them on the head. But

these are all post-Columbian. Not all the Pueblos even in our day practice toting, keeping up the good old custom, once in vogue from Smith Sound to Patagonia, of bearing loads on the back held in place by a band across the forehead or the breast. No ancient American water jars seem to have concave bottoms, but the circular padded ring is found in Arizona and New Mexico, and occurs in some collections from ancient sites. Dr. J. Walter Fewkes has found only one fragment of a small jar punched up at the bottom. It is therefore possible that the ancient inhabitants of Tusayan may have carried water on the



Fig. 157.

WATER-BOTTLE FROM TUSAYAN, ARIZONA, MADE OF COILED BASKETRY AND COVERED WITH PITCH.

From a figure in the Second Annual Report of the Bureau of Ethnology.

Cat. No. 42129, U. S. N. M. Collected by James Stevenson.

¹Figured also in Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1884, fig. 80; and in Second Ann. Rep. Bureau of Ethnology, figs. 484-488.

²Second Ann. Rep. Bureau of Ethnology, 1883, figs. 385-397.

³Op. cit., figs. 359-384. The papers of Holmes on the development of form and ornament should be examined.

head in jars convex or rounded on the bottom by means of the padded ring. The presence of the rings does not prove this altogether, since their function may have been to uphold the jar but not to carry it.

The head and the breast band, the shoulder and atlas yoke, and toting seem to have divided the earth among them in early times as carrying methods, and their areas are quite contiguous.

Example No. 40473 is called a carrying pad, *hā kin ne*, of the Zuñi Indians. It is made of the dried leaves of the *Yucca baccata*, split and plaited as in making a whip. These rings are made to fit the head comfortably, and serve the double purpose of sustaining a jar of water on the head and holding it upright on the ground. They also preserve the soft pottery from wearing away.

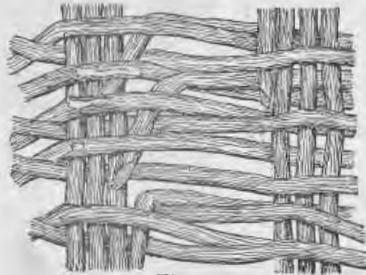


Fig. 158.

COARSE GATHERING-CRATE USED BY THE ZUÑI INDIANS OF NEW MEXICO.

Cat. No. 22971, U. S. N. M. Collected by James Stevenson.

Example No. 40466, collected in the pueblos of Arizona and New Mexico, illustrates a variety of head pads used in carrying jars. The Irish milkmaid catches up a kerchief or cloth and by a quirk or two converts it into a ring or crown which she places on her head before setting thereon the brimming pail. The Zuñi water carrier provides herself with a thick ring of bark, or especially of closely braided yucca, and on this she sets her round-bottomed jar. The



Fig. 159.

CANTEEN OF POTTERY, USED BY THE MOKI INDIANS OF ARIZONA.

Cat. No. 40093, U. S. N. M. Collected by James Stevenson.

same ring serves also in keeping the jar upright on the floor of her room.

The making of jars with receding bottoms modifies the size and function of the ring¹ (fig. 161).



Fig. 160.

VASE USED FOR CARRYING AND STORING WATER BY THE ZUÑI INDIANS OF NEW MEXICO.

Cat. No. 41150, U. S. N. M. Collected by James Stevenson.

Coronado (1540) wrote to his superior in Mexico: "I send your lord-

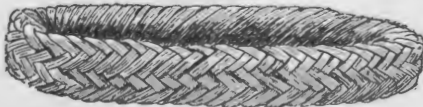
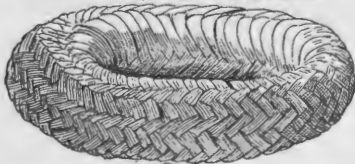


Fig. 161.

HEAD-PAIS USED BY THE PUEBLO WATER-CARRIERS OF NEW MEXICO.

Cat. No. 4966, U. S. N. M. Collected by James Stevenson.

ship two rolles which the women in these parts are wont to weare on their heads when they fetch water from their wells, as we used to do in Spain; and one of these Indian women with one of these rolles on her head will carrie a pitcher of water, without touching the same, up a lather.⁷²

Leaving the pueblo country the student may transfer his investigations among the unclassified Mission Indians, the Yuman, and the Piman families, all about the Colorado mouth. The U. S. National Museum is indebted to the Pasadena Association and to Miss Picher for some observations among the Mission carrying people. It is a singular fact that Indian women cut grass with such old knives as they may get, dry it,

¹Cf. Second Ann. Rep. Bureau of Ethnology, 1883, fig. 486; Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1887, fig. 19, Zuñi woman carrying water vase.

²Publications of the Hakluyt Society, London, 1890, iii, p. 454.

and sell it as hay to the Government. The huge bundles are rolled up and tied, and are carried on the top of the back, being held up in a variety of ways. In one case the good woman thrusts the end of a stick under the binding rope and holds onto that. In another, the woman attaches the ends of her carrying strap to the wrapping cord of the bundle, using the stick for a cane, and in a third case she uses both headband and staff, holding onto the latter with both hands above the shoulders (fig. 162).

Rockhill figures a woman of Imamu Chuang carrying a bundle of fagots on her back by means of a shoulder band.¹



Fig. 162.

MISSION INDIAN WOMAN OF SOUTHERN CALIFORNIA CARRYING HAY.

From a photograph in the U. S. National Museum by Miss Annie B. Picher.

Example No. 19742 (fig. 163) is a basket for carrying cactus fruit, collected among the Diegeños Indians, of the Yuman family, on the Mission Reservation, in Lower California. As will be seen, it is in twined weaving of the rudest sort, a globose wallet, strikingly similar in shape to the great pottery ollas made and used by the neighboring tribes. The noteworthy character about the specimen is the occurrence of twined weaving so far south. On the testimony of the national collections there does not exist a tribe south of this line that practices it.

Example No. 24145 (fig. 164) is one of the most interesting specimens in the world. It is the carrying frame and net of the Mohave Indians,

¹ "Diary of a Journey through Mongolia and Tibet," 1894, Smithsonian Inst., p. 81.

of the Yuman stock, dwelling about the mouth of the Colorado River, in Arizona. They live largely upon the mesquite bean, which they gather, pod and all, and grind for bread. Two poles 8 feet long bent in the form of an oxbow and crossing each other at right angles form the ground work. These are held in place by lashing at the bottom and by a hoop at the top. Four or five strong twines of agave fiber pass from the hoop above to the bottom of the framework between each pair of uprights. These and the uprights constitute the warp. The

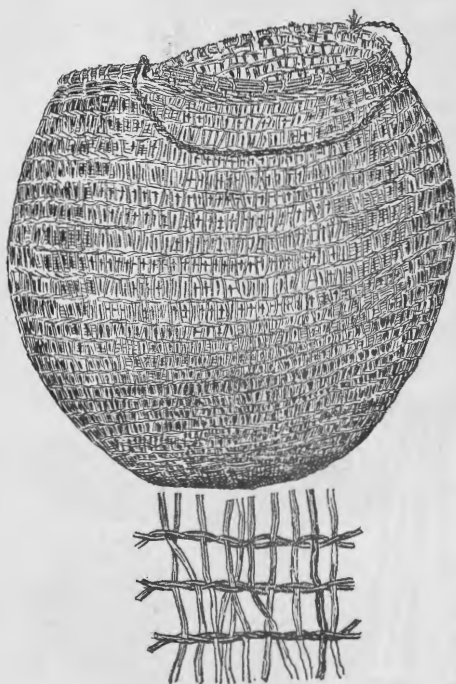


Fig. 163.

BASKET FOR GATHERING CACTUS, USED BY THE DIEGEÑOS
(YUMAN) INDIANS OF CALIFORNIA.

Cat. No. 19742, U. S. N. M. Collected by Edward Palmer.

kiho. Bandelier finds mention of it in the tradition of the Casa Grande.²

The principle is the same as that of the Mohave carrier just described, and the functions and environments are the same, but the structure is different. The Pimas dwell in the northwestern corner of Mexico, contiguous to the Yuma. They are by some considered a separate family, by others to be allied to the Nahuatl or Uto-Aztecan. At any rate, their weaving on the kiho or carrying basket is of the south.

Example No. 126680 (fig. 165) is a kiho of the Pimas collected by Edward Palmer. It consists of four straight sticks 4 feet long, tied

the weft is a new type of Indian textile on the Pacific Coast called "wrapped" weaving. A single twine is coiled round and round the frame, making meshes with the warp half an inch wide. Every time this weft passes the warp strings or poles, it is simply wrapped once around. The roughness of the agave fiber holds the wrap from slipping and preserves a tolerably uniform mesh. Foster describes the finding of cloth in a mound in Butler County, Ohio, and figures a specimen in which the twines are wrapped in the same manner.¹ The head-band is a rag tied to two of the upright sticks. This should be compared with the Jarawa basket, p. 433.

The Pima women make of native twine a kind of carrying basket or hod called

¹ Foster, "Prehistoric Races," Chicago, 1873, p. 225, fig. 29.

² Bandelier, *Archaeological Inst. Am. (Am. Series)*, III, 1890, p. 255.

together at one end for the bottom of the utensil, and fastened to a hoop at the other end for the top.

The network is done with a needle, and not with the fingers. It is netting or lace work, and not weaving at all. There is nothing to serve as a warp. The whole surface of the frame is covered by a continuous coil of agave fiber twine from bottom to top. Each coil is looped into the one beneath it by a "buttonhole stitch" or "half hitch," as shown in the drawing. In the Mexican hammocks each coil is simply caught under the preceding at regular intervals, while in more pretentious work the moving part is wrapped once, twice, or three times about the standing part as in Canadian snowshoes.

Accompanying this specimen and every other one of the kind in actual life is the staff, which serves a multitude of purposes to be explained later.

The Pimas and their neighbors make use of gourds as well as of pottery in carrying water and more compact freight.

Example No. 76047 (fig. 166) is a carrying gourd from the Pima country, collected by Edward Palmer. It is interesting in this connection on account of the net in which it is inclosed. About the bottom the twine is laid in the style of the Pima *kiho*. It is coiled in "half hitches." About the top it is served around the gourd itself in a series of half hitches. The headband is a rag caught into the network.

Example No. 19478 is a globular gourd from San Diego, Cal., Mission Indians. It is mounted in two zones of leather above and below, with lashing of rawhide rove through holes cut along their inner border like the snare of a drum, holding about a gallon.

The Papago Indians of northwestern Mexico make a very elaborate carrying device also called "*kiho*." Example No. 76033 (fig. 167) is a small-sized *kiho* collected by Edward Palmer. Four sticks and a hoop, as in the specimen last described, form the ground work, but they are disposed quite differently. Two of them, forming the back of the utensil, are 6 feet long, and extend below the *kiho* for legs and above it for binding the top load. The front pair of sticks start from the back pair a

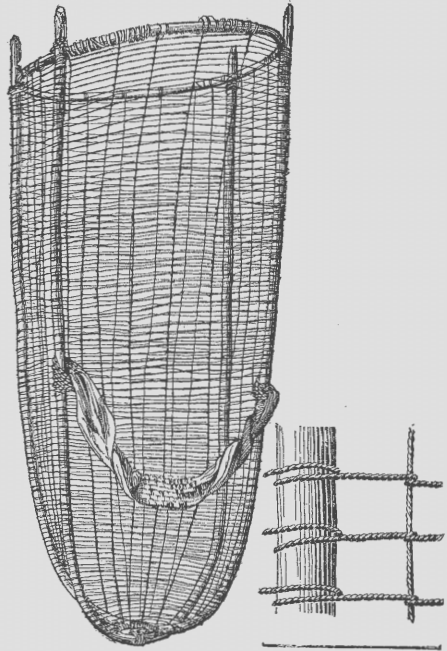


Fig. 164.

CARRYING-BASKET, WRAPPED WEAVING, USED BY THE MOHAVE INDIANS OF ARIZONA.

Cat. No. 24145, U. S. N. M. Collected by Edward Palmer.

foot, more or less, from the ground and are lashed to the hoop which forms the upper border. This hoop is so adjusted to these four sticks that when the woman is leaning forward with the load on her back the hoop shall be horizontal.

Covering the space between the hoop and the junction of the four sticks is a pyramidal bag of network starting from a ring of twine at the bottom and wrapped about the hoop at the top. This network is like that on the Pima basket, but is rendered ornamental by varying, according to a pre-determined plan, the number of times the moving part shall be wrapped about the standing part. The Papago Indians of the Piman stock have been lately studied carefully by Professor McGee, of the Bureau of Ethnology, and excellent descriptions and pictures of the carriers secured. It is a puzzle in technographic studies that the lacework on their carrying frame, or kiho, commonly called the buttonhole or half-hitch stitch,



Fig. 165.

CARRYING-BASKET OF COILED NETTING, USED BY THE PIMA INDIANS OF ARIZONA.

Cat. No. 126680, U. S. N. M. Collected by Edward Palmer.

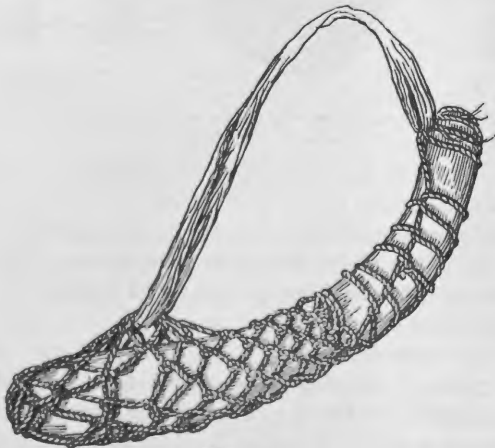


Fig. 166.

CARRYING-GOURD IN NETWORK, USED BY PIMA INDIANS OF ARIZONA.

Cat. No. 76947, U. S. N. M. Collected by Edward Palmer.

finds its most northern extension among the Piman stock. Nowhere in the Pueblo tribes is it found, according to the collections of the U. S. National Museum. But south of the Piman it occurs in Central America, in Latin South America as far south as Tierra del Fuego, where it will be found to be the only attempt at textiles. The open-work pattern is produced by enlargement and multiplication. The half hitches may be longer laterally

or centrifugally; that is, each one or a series of them may be made on a larger gauge. The multiplication takes place in the number of winds of the moving about the standing part in each stitch. The pattern is in fact a matter of counting and a fair indication of progress in arithmetic and geometry made by the Papagos.

This network is woven from a ring or loop of cord about 6 inches in diameter, and spreads out tent like to fit a hoop 2 or 3 feet in diameter. This hoop is attached to 3 or more poles of varying length, which act as spreaders, stays, foot rests, handles, stancheons, etc. To complete the outfit a mat of diagonal weaving in yucca fiber extends along one side of the apparatus, to act as a pad to protect the back, and a headband is fastened by its ends to two of the upright sticks.

Accompanying the kiho always is a staff about 4 feet long, with a short crotch on the top. Mr. William Dinwiddie, who accompanied Professor McGee, secured excellent photographs of a woman rising with the kiho, loaded with pottery and other objects (figs. 168-170). The kiho is stood upon its two short legs while the woman sits down with her back against it and draws the headband across her forehead. Virtually, she harnesses herself to the load. Taking her staff firmly in the right hand and grasping the hoop with the left hand, she leans forward and throws the load upon her back. Rising thereafter is a matter of several movements, in which the good right hand and the staff play a prominent part. She is now ready to walk away with her load.

The professional carriers of Mexico, men and women, use two kinds of headband and the breastband, either singly or combined, and the kinds of receptacles that are attached to the body thereby, as well as the varieties of merchandise therein, are innumerable. The loads shown on their backs in the U. S. National Museum collection of photos are bales of hemequin fiber, bales of goods formed up to suit the carrier, coops of poultry, all sorts of marketing and retail mer-

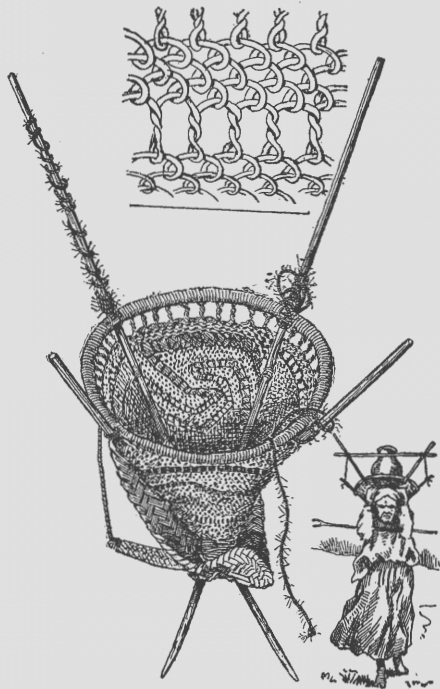


Fig. 167.

KIHO, OR PAPAGO CARRYING-FRAME, IN LACE WORK.

Cat. No. 76033, U. S. N. M. Collected by Edward Palmer.

chandise, furniture, pottery, basketry, water and pulque, frequently many times more bulky than the porter himself. The water carrier is



Fig. 108.

PAPAGO WOMAN ADJUSTING KIHŌ.

From a photograph in the Bureau of Ethnology.

a man whose neck muscles are marvels of toughness, for he supports a globular canteen on his back by means of a headband across his fore-



Fig. 169.

PAPAGO WOMAN RISING WITH KIHŌ.

From a photograph in the Bureau of Ethnology.

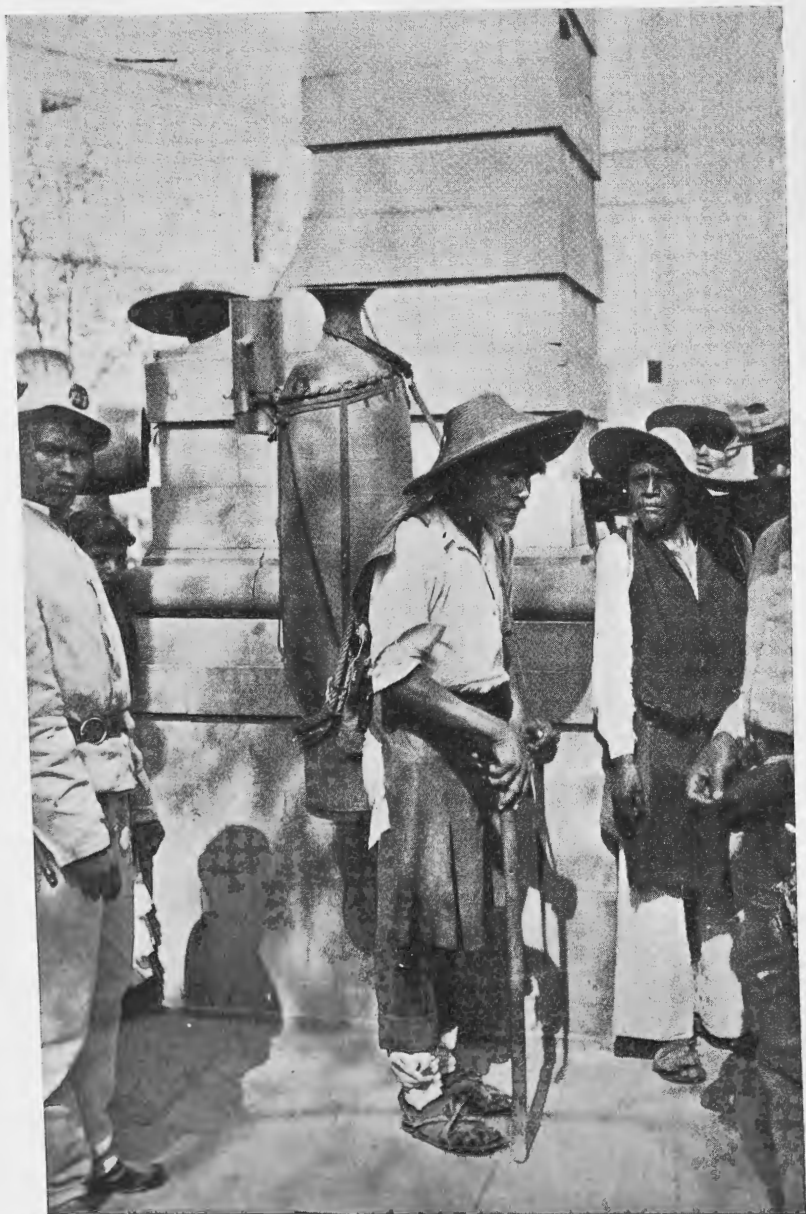
head at the same time that he supports a pitcher in front of him by means of a strap over the bregma. This process is better shown in a

EXPLANATION OF PLATE 24.

MEXICAN WATER PEDDLER.

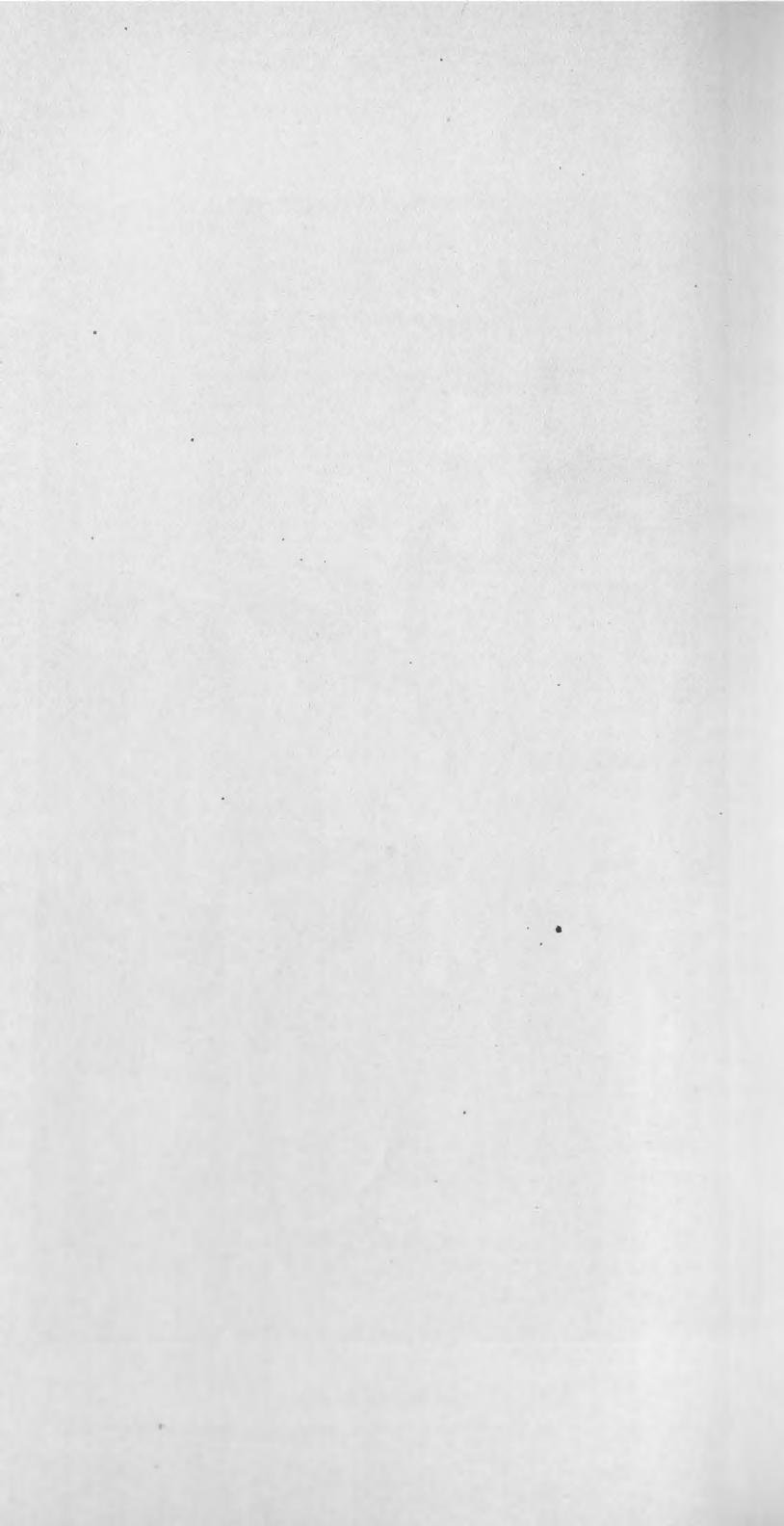
The man wears the sun and rain hat, and the old-time sandals without the single toe string. The long vessel derives its form not from the imitation of a natural object, but from several exigencies. It is to be slung below the center of gravity, to fit the back somewhat, to be carried by means of a band across the forehead, to enable the bearer to empty the liquid by bending his back. The straps about the neck of the vessel, held by its other end in his left hand, are for the purpose of drawing down and guiding the mouth of the can.

The plate is from a photograph in the U. S. National Museum by Rev. E. F. X. Cleveland, of Dundee, Ill., who says that this is the method of distributing water in Guanajuato, and that the metric system of measures is employed in selling, as may be seen by the cup at the top of the can. The town is in a valley between precipitous hills. A delightful spring on the side of the mountain is conducted to reservoirs, whence the carriers obtain their stock.



MEXICAN WATER PEDDLER.

From a photograph in the U. S. National Museum presented by Rev. E. F. X. Cleveland.



sketch of a butcher made for the author by W. H. Holmes (fig. 171). The economy of supporting force is equaled by the economy of points of attachment. This man is at once Pueblo Indian, packer, and the inventor of a new method of self-imposition in the form of a load hanging in front.

Illustrating the carriers of liquids there is in the U. S. National Museum a photograph of a water peddler of Guanajuato worthy of closest study, for he looks as though he had dropped in from Cairo (pl. 24).



Fig. 170.

PAPAGO WOMAN WITH KIHU PROPERLY MOUNTED.

From a photograph in the Bureau of Ethnology.

He has on his back a jar 4 feet in length slung in leather straps and hung to himself by a headband attached to the bottom of the jar. To the top of the jar is fastened a strap the other end of which he holds in his left hand. In order to deliver his water he uses his spine as a pivot by which the jar can be brought to a horizontal position and guided by the straps.

“The cargadores are trained from boyhood to carry heavy burdens over great distances. Don Pepe expected them to travel 8 leagues a

day. But when carrying lighter loads they will sometimes travel for several consecutive days at the rate of nearly 40 English miles a day. When the cargo bearers were moving in single file with their burdens, they looked like the Tamemes bearing tribute to Montezuma, as represented in the ancient pictures. It is probable that these men were enduring labors similar to those that had been performed by their ancestors for centuries before the arrival of the Spaniards."¹

The Mexican carrier enters into serious competition with all modern schemes to improve his country. Over the devious and painful trails of the mountains he knows the shortest cuts. Once in a while his



Fig. 171.

MEXICAN BUTCHER USING TWO HEAD-BANDS.

From a sketch by W. H. Holmes.

trail lies across the railroad, which he pauses for an instant to contemplate, and then he proceeds on his way, a bit of the olden time crossing the path of the nineteenth century (fig. 172). As in the drawing, his load on his back may be supported by breastband, or the more ancient headband may be in vogue. Some of his dress is modern, but his hat, or migratory house to defend his head from heat and rain and his eyes from the beating sun, is old; it is a survival. His sandals, especially dedicated to the travel and transportation industry, are old in form, but the coming of the Spaniard brought him horses and cattle and rawhide,

¹Lindesay Brine, "The American Indians; Their Earthworks and Temples," London, 1894, pp. 283-284.

which he did not have previously, and so there is about his feet just a suggestion of Mediterranean influence. On the very top of his load is his water flask of gourd, that the ingenious horticulturist has compelled to grow with a constriction about its middle for the sole occupation of its carrying strap. Beneath that is his poncho or shawl, at once cloak,



Fig. 172.

PROFESSIONAL CARRIER.

Mexico.

From a drawing by W. H. Chandler.

bed cover, and umbrella. On his back between it and the load is a soft padding, prelude to all saddle blankets.

The U. S. National Museum is indebted to E. F. X. Cleveland for a photo of the Mexican carrier in the last act of his drama (fig. 173). In this he has quit his mountain path and rivalry of the locomotive and freight car in one, and is in the act of carrying coal to feed the iron horse. His old-time hat gives place to the porter's cap. The visor is only the

shadow of the luxurious brim of his native sombrero. He can not discard the headband. His limbs are as bare as he is allowed to wear them, and his sandals have antique elements.

The carrying pole has a place in the Mexican transportation industry. Example No. 126592 (fig. 174) is a carrying device of great interest from Guadalajara, Mexico. The yoke is a flat piece of wood, slightly bent and pierced at the ends for slings or nooses. There is no cutting away to fit the shoulder, but the utensil may be worn as a Holland yoke or as a Chinese pole ad libitum. The sling at each extremity is of leather, attached by passing the bend through the hole and over the end. The noose or slipknot at the other end of the sling is for attach-



Fig. 173.

MEXICAN COAL CARRIER.

From a photograph in the U. S. National Museum by E. F. X. Cleveland.

ment to the top of a jar. In this specimen form is determined by function. But the apparatus has another interest, for it lies exactly on the boundary line between the man carrier and the donkey carrier. The jars should have been drawn with round bottoms. They fit into a wooden rack, one-half of which is shown in miniature in the drawing. By fastening two of these together and throwing them over the back of a donkey four jars full of liquid may be carried, or, as one may see every day in San Luis Potosi, the four jars rest in a rack, beneath which is a wooden wheel suggestive of the Chinese type. In point of fact, the student is witness to the two transfers of loads, to wit, that onto the wheel and that onto the beast.

"The Indians of central Yucatan are accustomed to carrying, which their fathers pursued before them from time immemorial, and they not only carry merchandise and the baggage of travelers, but travelers themselves."¹

The *mozos* or porters of Guatemala are obliged, when ordered by the *comandancia*, to carry burdens not to exceed four *arrobas* (100 pounds). Their pay is 3 reales, and they must not be sent beyond their district. They support the burden with the *mecapal*, a rawhide strap, against the forehead. The frame is called *carcaste* by the *Quiché*.²

"The women have a certain kind of dignity in their manner, caused, in a great measure, by their usage of carrying water jars and pans of crockery poised upon their heads. They therefore walk slowly and hold themselves upright. This custom, which begins from early childhood and forms part of their daily life, has the result of giving them good figures and a particularly graceful movement.

"The men, on the contrary, have a crouching appearance, caused by the method in which they have been accustomed from boyhood to carry their burdens. They relieve the pressure of the weight on their backs by means of a broad band passed over the forehead, and thus, by bending forward, the load is made less oppressive. The men and boys consequently contract a stooping posture, and this presents an unfavorable contrast to the women, whose bearing is precisely the reverse. There is another circumstance which has its influence in shaping the figures of the women. They carry all small things on the open palm of the left hand, which is thrown back and held well raised up. In fact, the same causes which affect the appearance of the Indians in North America are present here, but with the difference that there it is the squaw who contracts the stooping and bent figure, through carrying

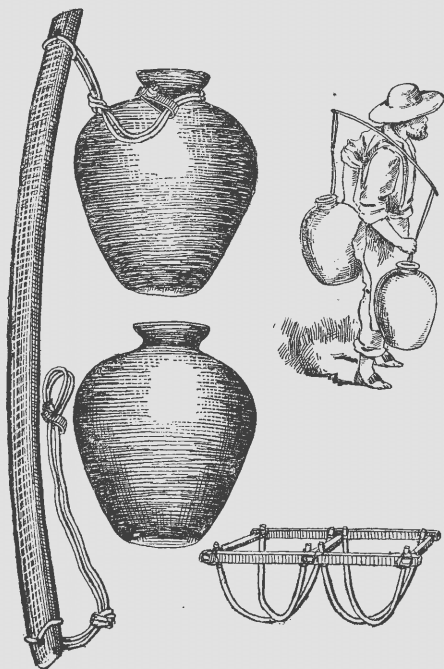


Fig. 174.

CARRYING-JARS, WITH POLE AND CRATE FOR SAME.
Guadalajara, Mexico.

Cat. No. 126592, U. S. N. M. Collected by Edward Palmer.

¹ Morelet, "Travels in Central America," New York, 1871, p. 279.

² Brigham, "Guatemala," New York, 1887, p. 78; figure, p. 98.

her children and other burdens, and it is the man who maintains the upright figure and dignified manner."¹

Example No. 129654 (fig. 175) from Honduras, is a simple net made of twine in one continuous piece, wrapped backward and forward to form the warp and then woven through plainly for the weft. Leaving a few inches for attachment the selvage at each end is formed by twined weaving almost out of place in this area. The square netting is also rare, most of the bags and hammocks being in the netted style.

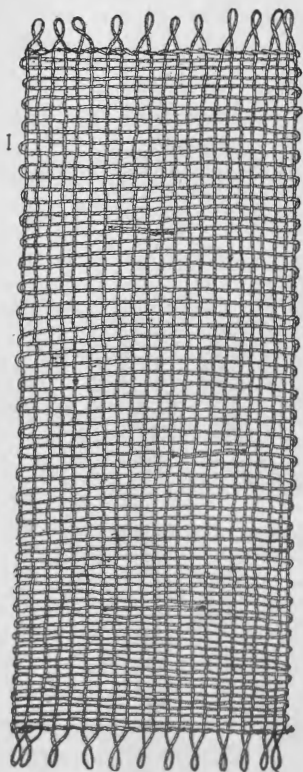


Fig. 175.

CARRYING-NET FROM HONDURAS.

Cat. No. 129654, U. S. N. M. Collected by C. F. Townsend.

In this device there are borrowed African features.

That the negro race, introduced at the beginning of the sixteenth century into middle America, modified and in places crowded out the aboriginal arts is easily proven. In the museum of the Peabody Academy in Salem is a carrying frame labeled Panama, which I here produce through the kindness of Prof. E. S. Morse (fig. 177). It consists simply of two palm fronds in which the stalks are the basis sticks, and the network is made up of the leaflets twined together. A headband of cotton cloth completes the outfit. This specimen is almost identical with fig. 107, from West Africa.

Example No. 126805 (fig. 176) is a carrying frame from Honduras, collected by Consul A. E. Morlan. To the student of comparative technography it is worthy of close attention. It is framed on two poles, on which rests a structure suggestive of the California baby cradles, and of the porters' frames of West Africa. The sides and border are of wood, paneled with a textile in diagonal weaving. It is quite within the area of probability that in this

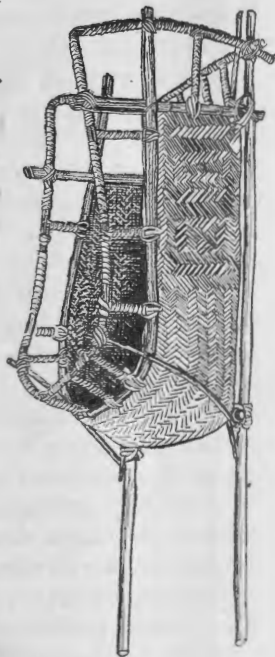


Fig. 176.

CARRYING-FRAME FROM HONDURAS.

Cat. No. 126805, U. S. N. M. Collected by Consul A. E. Morlan.

¹ Lindsay Brine, "The American Indians; Their Earthworks and Temples," London, 1894, pp. 188-189.

“About St. Pierre, in Martinique,” says Lafcadio Hearn, “the erect carriage and steady, swift walk of the women who bear burdens is likely to impress the artistic observer

* * * and the larger part of the female population of mixed blood are practiced carriers. Nearly all the transportation of light merchandise as well as of meats, fruits, vegetables, and food stuffs to and from the interior is effected upon human heads. * * * Packets are loaded and unloaded by women and girls—able to carry any trunk or box to its destination. At Fort de France the great steamers are entirely coaled by women, who carry coal on their heads, singing as they come and go in processions of hundreds. The highest type of professional female carrier is to the charbonniere, or coaling girl, what the thoroughbred racer is to the draft horse—

the type of porteuse selected for swiftness and endurance to distribute goods in the interior parishes, or to sell on commission at long distances.

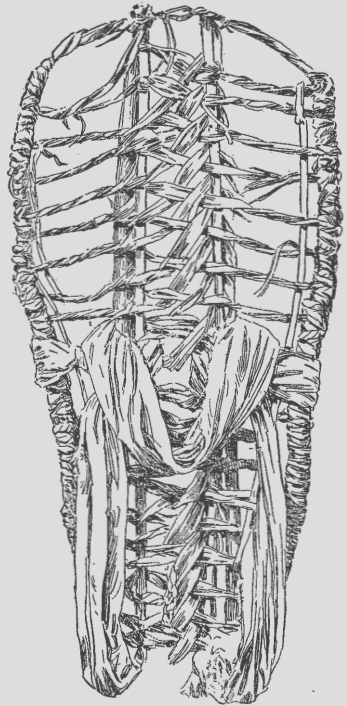


Fig. 177.

CARRYING-FRAME OF PALM FROND, FROM PANAMA.

From a specimen in the Peabody Academy, Salem, Mass.



Fig. 178.

PORTEUSE, OR CARRIER IN LESSER ANTILLES.

From a figure in Hearn's "Midsummer in the Tropics."

“At a very early age she learns to carry small articles upon her head, a decanter of water, or an orange in a plate. At 9 or 10 she is able to tote a tolerably heavy basket or a tray weighing from 20 to 30 pounds and to walk barefoot 12 or 15 miles a day. At 16 or 17 she carries a tray and burden of 120 to 150 pounds' weight or walks 50 miles a day as an itinerant seller. * * * The weight is so great that no well freighted porteuse can unassisted either load or unload herself. She can not even sit down under her burden. * * *

“She wears no shoes. She must climb thousands and descend thousands of feet every day; march up and down slopes so steep that the horses of the country all break down after a few years.”¹

In St. Pierre itself women carry burdens on the head, “peddling

¹ Hearn, “Two Years in the French West Indies,” New York, 1890, p. 103.

vegetables, cakes, fruit, ready-cooked food, from door to door (fig. 178). * * * These women can walk all day long up and down hill in the hot sun, without shoes, carrying loads of from 100 to 150 pounds on their heads, and if their little stock sometimes fails to come up to the accustomed weight, stones are added to make it heavy enough. * * * I have seen a grand piano carried on the heads of four men. With the women the load is seldom steadied with the hand."¹

The coaling at Kingston, Jamaica, is done by women. They lift the baskets upon their heads and walk on board the ship, and as they go round the plank and come out there is a little brass piece given each one. These women are very skillful in Curaçao. They have been

known to take numerous clothes baskets on their heads and march along. You hear them paddling all day long; it is a continuous clatter. One of the curious things about them is the fact that the poorest of them will have their pure white clothes, and a friend writes that in the Spanish islands you can buy from them just as much with a 3-cent piece as with a 10-cent piece. They bore a hole through it because they fear that travelers will spend it again. Coal is transported to these islands; the steamer comes right up alongside the wharf, and women carry the freight.

In the South American Cordilleras the carrying art has little new information to offer. This much is true, that the configuration of the country and the political and commercial conditions resulting therefrom multiplied

the number of backs that had burdens to bear, made of them a class or caste, organized them into more complex social units, and greatly increased the length of the journey. Long roads were laid out, paved in some places, bridges were thrown over deep chasms, and a system of relays was established.

Humboldt, speaking of the carriers in his day, says:

In those times of oppression and cruelty (sixteenth century) which have been described as the era of Spanish glory the commendatorios (encomienderos) let out the Indians to travelers like beasts of burden. They were assembled by hundreds, either to carry merchandise across the Cordilleras or to follow the armies in their expeditions of discovery and pillage. The Indians endured this service more patiently because, owing to the almost total want of domestic animals, they had



Fig. 179.

NAPO INDIAN CARRIER.
Ecuador.

From a figure in Stanford's Compendium.

¹Hearn, "Midsummer in the Tropics," New York, 1890, p. 40.

long been constrained to perform it, though in a less inhuman manner under the government of their own chiefs.¹

The explorers of the Isthmus of Panama found the Indians engaged in commerce, and upon their backs laid the timbers of the first boats ever sailed on the Pacific by Europeans. In Stanford is the picture of a Napo Indian carrier (fig. 179). The scant costume, the basket of cane, the headband, the two staves, are of old. The shabby dress replaces the old-time clothing of bark cloth universally donned by the natives of tropical America formerly.

Hassaurek says that the Indians of Ecuador carry everything on their backs, the load being tied to their forehead. Their strength lies in the muscles of the neck and not in their arms. They carry stone, brick, sand, lime, furniture, vegetables, meat, etc., and pass along laughing or talking, or in sullen silence, but you never hear them sing.²

Near Quito the traveler is surprised by the sight of many an Indian woman, who not only carries a load on her back, with a babe tied to the top of the carga, but also spins cotton as she trots along.³ Mrs. Fannie B. Ward says that she has seen Peruvian women and men walking along by the side of a llama spinning the wool that the animal was shedding, using the creature for a natural distaff.

Whymper figures a man carrying a huge jar of water (fig. 180). He is barefooted and clad in European dress. Upon his lower back rests a pad of cloth and on the top of this the vessel, round bottomed and inclosed in a sling or network in which the two rope rings rest against the sides of the jar instead of around the neck and the bottom. These are united by cross lines so as to retain the vessel from all directions. A strap passes from the network around the man's breast. There is no headband.⁴

The aboriginal water carrier of Cajamarca figured by Wiener is clad partly in native and partly in European rags; but his water jar is of the universal type, globose, with lugs on the side, through which a braided rope passes and thence over the right shoulder and under the left arm.⁵



Fig. 180.

DEVICE FOR CARRYING WATER JAR ON THE BACK.
From a figure in Whymper's "Great Andes of the Equator."

¹ Humboldt's Travels, Bohn, II, p. 31.

² Hassaurek, "Four Years Among Spanish Americans," New York, 1867, pp. 89-90.

³ Hassaurek, op. cit., p. 89.

⁴ "Great Andes of the Equator," New York, 1892, Scribner, p. 169.

⁵ "Pérou et Bolivie," p. 128.

Raimondy says the Jivaro of northern Peru carry loads of a hundredweight with ease over the worst of mountain tracts. The women use a covering for the lower portion of the body, called the pampanilla, protecting sometimes the upper portion with a mantle, in which they generally carry their children before them. The Llameo, Cocama, and Omagua of Nanta are land carriers and boatmen.¹

On the Brazilian coast Hawkins (1593) says that "the women fetch the water and do all drudgerie whatsoever. Their childe they carry in a wallet about their necke, ordinarily under one arme."

If one kills any game in hunting he does not bring it home, but strews leaves to mark his path and sends his wife back after it. On a journey or going to war the women carry all.

Example No. 131222 (fig. 181) in the U. S. National Museum collections, from Sandy Point, Straits of Magellan, is the model of a carrying basket made of rushes, a specimen of which is to be found in every Fuegian bark canoe. The notable feature about the specimen is that while it is a coiled basket it also has the pe-



Fig. 181.

CARRYING-BASKET, COILED IN HALF HITCH OR BUTTONHOLE STITCH.

Straits of Magellan.

Cat. No. 131222, U. S. N. M.

culiar characteristic of the Central American netted bagging. As in all spiral basketry, the foundation is a rod or a bunch of fiber coiled continuously from bottom to top. These coils are held together, not by a continuous whipping or sewing, but by a series of half hitches or buttonhole stitches. The Japanese lunch baskets carried by school children have a similar stitch, but the weft is wider and more closely woven. The handle of the basket is plaited.

The Patagonians are said to build up their hair with a "hair lace of ostrige feathers, and make it a stoar house for all things * * * a quiver for their arrows, a sheath for their knives, a box for fiersticks, etc."²



Fig. 182.

COFFEE CARRIER OF RIO

From a figure in Wilkes' "Narrative of the United States Exploring Expedition during the years 1838-1842."

¹Raimondy, "Indian Tribes of the Great District of Loreto, Northern Peru," *Anthrop. Rev.*, London, 1863, 1, No. 1, pp. 34-36.

²Drake, "The World Encompassed," *Publications of the Hakluyt Society*, London, 1854, pp. 50, 52.

Mr. im Thurn says that in Guiana the hard work falls to the women. They clean the house, fetch water and firewood, cook the food, make the bread, nurse the children, plant the fields, dig the produce, and when the men travel the women carry whatever baggage is necessary. The women bring water for the house in clay bottles or gourds (goobies), or they take surianas, large baskets fitting on the back and supported by a band across the forehead, and fetch heavy loads of firewood.¹

Carrying on the head is most common in Brazil. M. Biard gives a great variety of methods of submitting the head to a load, among them a single negro toting five empty wine casks, and a company of six bearing a grand piano on the head, keeping time to the sound of a rattle.²

According to Wilkes the slaves are almost the only carriers of burdens in Rio Janeiro. They go almost naked, and are exceedingly numerous. They appear to work with cheerfulness, and go together in gangs, with a leader who carries a rattle filled with stones (fig. 182). With this he keeps time, causing them

all to move on a dogtrot. Each one joins in the monotonous chorus, the notes seldom varying above a third from the key. The words they use are frequently relative to their own country; sometimes to what they heard from their master as they started with their load, but the sound is the same. The coffee carriers go in gangs of twenty or thirty. In singing, one-half take the air, with one or two keeping up a kind of hum on the common chord, and the remainder finish the bar. These slaves are required by their masters to obtain a certain sum according to their ability, say, from 25 to 50 cents a day, and to pay it every evening. The surplus belongs to themselves. In default of not gaining the requisite sum, castigation is always inflicted.

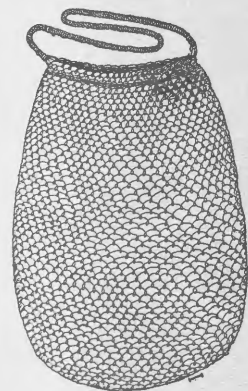


Fig. 184.

CARRYING-BASKET OF COILED NETTING, FROM BRAZIL.

Cat. No. 152507, U. S. N. M. Collected by F. G. Fry.

The usual load is about 200 pounds.³ The methods employed are from the Old World and especially negroid.

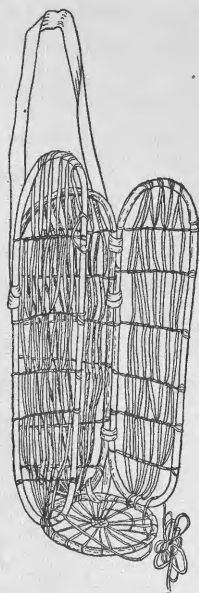


Fig. 183.

CARRYING-FRAME, FROM UPPER SHINGU, BRAZIL.

From a figure in vonden Steinen's "Unter den Naturvölkern Zentral-Brasilien."

¹ im Thurn, "Indians of British Guiana," I, p. 216; Wallace, "Travels on the Amazon," p. 254; H. H. Smith, "Brazil," New York, 1879, p. 371.

² "Le tour du Monde," Paris, iv, p. 15.

³ Wilkes, "Narrative of the U. S. Exploring Expedition during the years 1838-1842," I, p. 52.

One of the most striking resemblances possible in culture objects in two hemispheres is the carrying frame from the Shingu (fig. 183) and from the west coast of Africa, almost opposite on the South Atlantic and not very far away, and both under Portuguese influence. The apparatus consists of a circular hoop for bottom, with coarse lacing of fiber and three elongated ellipses of the same style for the sides and bottom.¹ The African specimen is carried on the back and shoulders, sustained by the



Fig. 185.

COOPERATIVE CARRYING.

Men on the Shingu launching canoe.

From a figure in von den Steinen's "Unter den Naturvölkern Zentral-Brasiliens."

staff, while the Brazilian specimen has had to submit itself to the local attachment of the headband.

Example No. 152507 (fig. 184) is a carrying bag, said to come from Brazil. By examination of the texture it will be seen that the construction is precisely that of the Mohave carrying crate, of many examples from the Central American States and of the Fuegian carrying

¹ von den Steinen, "Unter den Naturvölkern Zentral-Brasiliens," p. 237.

basket minus the warp or foundation rod. Now, all such ware is made on a spacer or gauge of different sizes. One has only to imagine the gauge left in the mesh to see how the Fuegian and the other varieties could be transformed one into another.

A lively scene in the portage or transportation of a woodskin, or bark canoe is figured by von den Steinen.¹ A dozen stout men, naked excepting a girdle, are merrily bringing the canoe on their shoulders and in their hands. The picture is a remarkable one for the variety of ways in which the men are at work. (Fig. 185.)

CARRYING APPLIANCES IN THE U. S. NATIONAL MUSEUM.

AFRICAN TRIBES.

Museum number.	Specimen.	Locality.	By whom contributed.
4809	Haversack	Africa	John Cassin.
4947	Bag, grass	do	National Institute.
4948	do	do	Do.
4949	Haversack, leather	do	Do.
4965	do	do	Do.
5155	do	West Africa	R. R. Gurley.
151129	Packing basket (fig. 104)	Angola	U. S. Eclipse Expedition.
151130-151131	Carrying basket, long	Gold coast, Africa	Stewart Culin.
76536-76537	Wallet for fruit	Africa	New Orleans Exposition
151132	Carrying barrow and outfit	do	Stewart Culin.
151133	Wallet	West Africa	Do.
151203	do	East Africa	W. L. Abbott.
151248	Haversack, Masai	do	Do.
141825	Wallet	do	Do.
152612	Carrying basket Balumbo (fig. 105)	do	Carl Steckleman.
164874	Carrying basket	Gaboon, Africa	Rev. A. C. Good.
166135	Shoulder cloths	West Africa	Heli Chatelain.
166143	Carrying basket	do	Do.
166146	Carrying basket, Angola	do	Do.
168887	Wallet, leather, Mandingo	Africa	Colonization Society of Washington, D. C.
168907	Straps, carrying	East Africa	W. A. Chanler.
168911	Bag, traveling	do	Do.
167500	do	do	W. H. Brown.
166222	Basket, carrying	West Africa	Heli Chatelain.
169128	Carrying frame (fig. 106)	Kongo	T. H. Camp.

EUROPEAN PEASANTRY.

131091	Porter's knot and cap (fig. 110)	London, England	Edward Lovett.
131092	Yoke for carrying	do	Do.
131093	Yoke and carrying ropes (fig. 108)	do	Do.
128800	do	Russia	New Orleans Exposition.
167006	Net bag for carrying eggs	Madrid, Spain	Walter Hough.
167007	Porter's strap	do	Do.
164803	Yokes for carrying water	Venice	H. H. Giglioli.
150833	Carrying baskets	Morocco	Royal Ethnological Mu- seum, Berlin.

¹ "Unter den Naturvölkern Zentral-Brasiliens," Berlin, 1894, pl. x, opp. p. 120.

CARRYING APPLIANCES IN THE U. S. NATIONAL MUSEUM—Continued.

EUROPEAN PEASANTRY—continued.

Museum number.	Specimen.	Locality.	By whom contributed.
167787-167788	Carrying tray	Turkey	R. J. Levy.
28155	Open wallet (fig. 112)	Lapland	Russian Government.
167820	Carrying basket	Finland	Hon. John M. Crawford.
167821	Knapsack	do	Do.

ASIATIC AND INDO-PACIFIC PEOPLES.

164745	Carrying basket (fig. 118)	Andaman Islands	Enrico Giglioli.
27189	Basket, fruit	Siam	King of Siam.
27613	Carrying baskets (fig. 115)	do	Do.
165410	Vessel, wooden, for milk	Manila	Alex. R. Webb.
4451	Basket, provision	Fiji Islands	Captain Magruder, U. S. N.
3239-3251	Basket haversack	do	Lieutenant Wilkes, U. S. N.
4419	Basket haversack	do	Do.
4538	Basket haversack	do	Do.
23978-23980	do	do	Isaac M. Brower.
73386	Carrying net (fig. 119)	New Guinea	A. P. Goodwin.
3397	Haversack	Samoa Islands	Lieutenant Wilkes, U. S. N.
130770	do	do	Lieut. W. E. Safford, U. S. N.
3842	do	Penrhyn Islands	Lieutenant Wilkes, U. S. N.
76560	Wallet, Maori seed	New Zealand	New Orleans Exposition.
3501-3504	Baskets, grass	Sandwich Islands	Lieutenant Wilkes, U. S. N.
151113	Haversack, banana and maiden-hair roots.	do	Mrs. Sibyl Carter.
3538-3540	Large gourds, with network	do	Lieutenant Wilkes, U. S. N.
3776	Bag, traveling	New Zealand	Do.
129760	Haversack	Easter Island	W. J. Thomson.
1535	Satchel	Australia	C. R. Raymond.
54171-54174	Basket, market (fig. 124)	China	Centennial Commission
74506	Carrying pole (fig. 123)	do	Do.
73093, 73094	Basket, hunter's and fisherman's.	Tate Yama, Japan	P. L. Jouy.
150684	Bag, carrying	Yezo, Japan	Romyn Hitchcock.
150768	Headband and seat (fig. 133)	do	Do.
22254	Headband (fig. 126)	do	Do.
28189	Basket, fish	Japan	Japanese Commission.
169034	Chair, lady's carrying	Korea	Korean Commission.
153613	Carrying-cloth, with cover	do	Ensign J. B. Bernadou, U. S. N.

ESKIMO AND ALASKAN INDIANS.

44685	Traveling bag, Man's, Nerpa skin.	Cape Nome, Alaska	E. W. Nelson.
43334	do	Golovina Bay, Alaska	Do.
36025	Strap for back load	do	Do.
38074-38075	Haversack, grass	do	Do.

CARRYING APPLIANCES IN THE U. S. NATIONAL MUSEUM—Continued.

ESKIMO AND ALASKAN INDIANS—continued.

Museum number.	Specimen.	Locality.	By whom contributed.
38467	Haversack, grass, small	Golovina Bay, Alaska ..	E. W. Nelson.
37630	Haversack, grass.....	St. Michaels, Alaska	Do.
43480	Bag, hunting	do	Do.
36184	Satchel, fishskin.....	Kushunuk, Alaska	Do.
37640	Haversack, sealskin.....	Chalitmut, Alaska	Do.
24684	Haversack, grass.....	Norton Sound, Alaska ..	L. M. Turner.
32961-32965	Satchel, straw	do	E. W. Nelson.
32971-32974	Bag, traveling, straw.....	do	Do.
894	Bag, hunting	Yukon, Alaska	R. Kennicott.
8782	Haversack, fishskin	Yukon River, Alaska....	W. H. Dall.
48832	do.....	Lower Yukon, Alaska ..	E. W. Nelson.
38304	Wallet, bladder	do	Do.
38305	Haversack, grass.....	do	Do.
38309	Wallet, fishskin	do	Do.
38316	Bag, leather, and fishskin	do	Do.
38465	Wallet, rush, long	do	Do.
38693	Wallet, bladder	do	Do.
38308	Sack, fishskin	Alaska	Do.
38796	Sack, sealskin	Anvik, Alaska	Do.
37871	Bag, fishskin	Askeenuk, Alaska	Do.
37872	Sack, grass	do	Do.
36185	Satchel, fishskin	do	Do.
7580	Bag, sealskin	Cape Romanzoff, Alaska	W. H. Dall.
7778	do.....	do	Do.
36183	Satchel, fishskin.....	Kuskokwim, Alaska	E. W. Nelson.
67996	Haversack, beaded	Alaska	J. J. McLean.
16320	Straps, packing	Nunivak Island, Alaska.	W. H. Dall.
38466	Basket, grass, large	Kuskokwim, Alaska	E. W. Nelson.
37401-37404	Sack, fishskin	Nushagag, Alaska	Do.
127325-127326	Breast yokes	Togiakmut, Alaska.....	S. Applegate.
55946	Breast collars	Bristol Bay, Alaska	Charles L. McKay.
38843	Sack, straw, large	Nushagag, Alaska	E. W. Nelson.
73055	Wallet, of fur	Alaska	Charles L. McKay.
72496-72497	Pouch, hunting	do	William J. Fisher.
72500-72502	do.....	do	Do.
38306	Wallet, rush	Big Lake, Alaska.....	E. W. Nelson.
14976-14980	Wallet, sea grass, ornamented	Aleutian, Attu Island, Alaska.	W. H. Dall.
36990-36992	Basket, mat	do	L. M. Turner.
76346	Wallet	do	T. H. Bean.
168296	Wallet, grass.....	do	Lieut. G. T. Emmons.

INDIANS OF EASTERN NORTH AMERICA.

1979	Wallet	Arctic coast	B. R. Ross.
2041	Bag	Mackenzie River	Do.
2549-2550	Haversack, ornamented.....	Fort Simpson.....	W. L. Hardesty.
2608	Basket, grass	do	Do.
2020	Bag, hunting.....	do	B. R. Ross.
2047	do.....	do	Do.
2609	Satchel, birch bark.....	do	W. L. Hardesty.
5112	Pouch, hunting	do	Do.

CARRYING APPLIANCES IN THE U. S. NATIONAL MUSEUM—Continued.

INDIANS OF EASTERN NORTH AMERICA—continued.

Museum number.	Specimen.	Locality.	By whom contributed.
542	Haversack (Yellow Knife Indians)	Fort Resolution	R. Kennicott.
2048	Bag, hunting (Yellow Knife Indians).	.....do	B. R. Ross.
2551	Bag, hunting.....	Fort Rae.....	Strachon Jones.
548	Bag, skin	Mackenzie River	B. R. Ross.
527	Bag, hunting.....	Fort Simpson.....	Do.
127140	Bag, sealskin (square)	South Greenland	Mrs. Lilla Pavy.
127141	Bag, sealskin (hand) .....	.....do	Do.
128079	Bag, leather (hand)	Greenland	Do.
153505	Pouch for gun caps	Labrador	Henry G. Bryant.
153508	Wallet (Montagnais Indians) .....	.....do	Do.
54404-54441	Wallet, porcupine quill	Canada	J. Varden.
1937-1939	Wallet, large leather, ornamented (Sioux).	Upper Missouri River ..	Lieut. G. K. Warren. U. S. A.
154320	Wallet of grass and bark.....	Leach Lake, Minn.....	Dr. W. J. Hoffman.
152963	Parfleche case (Kiowa Indians) ..	Indian Territory	Jas. Mooney.
164821	Bag, hunting.....	Pine Ridge Agency.....	Miss E. C. Sickels.
164823	Bag, traveling.....	.....do	Do.
168408	Satchel.....	Kansas	F. W. Clarke.
8553	Haversack, buffalo skin.....	Nebraska.....	S. M. Horton.
154035	Haversack (Sioux Indians)	Montana.....	Mrs. M. M. Hazen.
165840	Parfleche case, small (Cheyenne Indians).	Wyoming.....	H. R. Voth.
165918	Parfleche case, clothing (Cheyenne Indians) (figs. 135, 136).	.....do	Do.
6910	Sack, provisions (Comanche).....	.....do	Edward Palmer.
91508	Basket, carrying (Choctaw) (fig. 138).	Alabama.....	Do.
91509	Basket, berries (Choctaw Indians).	.....do	Do.
8430	Carrying basket (fig. 137).....	Arikaree Indian.....	Dr. W. Matthews, U.S.A.

WEST COAST INDIANS.

168293	Wallet, beaded.....	Alaska	Lieut. G. T. Emmons U. S. N.
21560	Basket, large, Kolu-schan Indians.	.....do	Dr. J. B. White.
60227-60228	Packing straps, hide.....	Southeastern Alaska ..	J. J. McLean.
11410	.....do.....	British Columbia.....	V. Colyer.
168163	Wallet, spruce root (fig. 140) .....	.....do	Herbert Odgen.
60330	Pouch, hunting, fur	Southeastern Alaska ..	J. J. McLean.
20808	Pouch, hunting, beaded.....	Prince Wales Island, Alaska.	J. G. Swan.
20811	Pouch, hunting, small.....	.....do	Do.
4123	.....do.....	Northwest Coast, Amer- ica.	Do.
648	Basket, carrying.....	.....do	George Gibbs.
685	.....do.....	.....do	Do.
2552-2553	Pouch, hunting .....	.....do	Lieutenant Wilkes, U. S. N.
23477-23478	Baskets Towanahoo Indians.....	Hoods Canal	J. G. Swan.
108283	Wallet	Alaska	Lieut. G. T. Emmons.
168294	Wallet, gut.....	.....do	Do.

CARRYING APPLIANCES IN THE U. S. NATIONAL MUSEUM—Continued.

WEST COAST INDIANS—continued.

Museum number.	Specimen.	Locality.	By whom contributed.
2127	Wallet, waterproof.....	Northwest Coast, America.	Lieutenant Wilkes, U. S. N.
153550	Wallet.....	Baffin Land.....	Dr. Franz Boas.
1289	Wallet, sea grass.....	Washington.....	J. G. Swan.
23369	Wallet, bark-woven.....	Neah Bay, Washington.	Do.
76634	Wallet, cedar-bark.....	Washington.....	Do.
151452	.....do.....	.....do.....	Dr. Franz Boas.
127843	Carrying wallet (fig. 144).....	Quiniault, Wash.....	Charles Willoughby.
165137	Valise of rawhide.....	Wyoming.....	Jas. Mooney.
166541	Case (parfleche).....	Washington.....	Dr. E. L. Morgan.
1292	Straps, for carrying load.....	.....do.....	J. G. Swan.
130976	.....do.....	.....do.....	E. C. Chirouse.
23479-23480	Basket, carrying (Clallam Indians)	.....do.....	J. G. Swan.
19026	Carrying basket (fig. 145).....	.....do.....	Do.
1778	Satchel, strips of bark.....	Columbia River.....	Dr. Suckeley, U. S. A.
24104	Basket for carrying roots (Klamath Indians).	Oregon.....	L. S. Dyar.
24116	Satchel, made of tuli (Klamath Indians).	.....do.....	Do.
24122	Sack, carrying grain.....	.....do.....	Do.
18897	Net, agave fiber (fig. 151).....	California.....	Edward Palmer.
19706	Net, carrying.....	.....do.....	Stephen Powers.
19472	Basket, cactus fruit.....	.....do.....	Edward Palmer.
19743-19744	Basket, fruit (fig. 163).....	.....do.....	Do.
19745	Basket, acorns.....	.....do.....	Do.
19769	Bag, fruit, etc.....	.....do.....	Do.
19770	Bag, cones of pines.....	.....do.....	Do.
24165	Basket, carrying.....	.....do.....	Do.
131139	Carrying net (fig. 152), Missions.....	.....do.....	Do.
131148	Basket and strap, carrying (Hupa Indians).	.....do.....	Jeremiah Curtin.
131161	Basket for acorns.....	.....do.....	Do.
128907	Headband (fig. 147), Hupa Indians.....	.....do.....	Lieut. P. H. Ray, U. S. A.
167410	Basket, carrying, conical.....	.....do.....	H. W. Henshaw.
165687	Basket, carrying (Pima Indians).....	.....do.....	F. W. Hodge.
126680	Basket, carrying (figs. 165), Pima Indians.	.....do.....	Edward Palmer.
174523	Basket, carrying (Papagos).....	Arizona.....	W J McGee.
10351	Basket, for seed.....	Fort Mohave, Colorado..	Edward Palmer.
168412	Satchel, beaded.....	Colorado.....	F. W. Clarke.
152528	Pouch, hunting.....	.....do.....	Lewis Engel.
70929-70937	Basket, carrying (fig. 155), Moki.....	Arizona.....	Col. Jas. Stevenson.
128913	.....do.....	.....do.....	Mrs. T. E. Stevenson.
166707	Basket, carrying (Zuñi Indians).....	New Mexico.....	Jas. Mooney.
68465-68475	.....do.....	.....do.....	Col. Jas. Stevenson.
68544-68550	.....do.....	.....do.....	Do.
68701-68714	Gourd, for carrying water (Moki Indians).	.....do.....	Do.
71020	Basket, water-tight (Moki Indians).....	.....do.....	Do.
84263	Strap, carrying, with hair ropes.....	.....do.....	V. Mindeleff.
9540	Rope, woolen, for carrying wood (Zuñi Indians).	.....do.....	Edward Palmer.
68633	Carrying bands (Zuñi Indians).....	.....do.....	Col. Jas. Stevenson.

CARRYING APPLIANCES IN THE U. S. NATIONAL MUSEUM—Continued.

WEST COAST INDIANS—continued.

Museum number.	Specimen.	Locality.	By whom contributed.
68655-68656	Shoulder pad (Zuñi Indians)	New Mexico.....	Maj. J. W. Powell.
27827	Net basket, prop stick, headband..	Arizona	Mrs. Geo. Stout.
1804	Cushions, for carrying (Mohave Indians).	.....do	Lieutenant Whipple, U. S. A.
1514	.....do	Mexico	Dr. Berlandier.
73934	Head strap (Yucatan).....	.....do	L. H. Aymé.
73974	Packing rope .....	.....do	Do.
24145	Basket, carrying (fig. 164), Mohave.	California	Edward Palmer.
9981	Net, to carry burdens	Colorado River	Do.
12064	Haversack (Pai Utes)	Southern Utah.....	Maj. J. W. Powell.
14382	.....do .....	.....do	Do.
14397	Haversack, beaded, with strap .....	.....do	Do.
14493	Bladder, for carrying water .....	.....do	Do.
14664-14675	Baskets, for fruit and seeds .....	.....do	Do.
17196	Haversack, rawhide (Ute Indians).....	.....do	Do.
42155	Carrying basket (fig. 150), Utes....	Utah	Do.
19026	Basket, large, conical, for seeds, etc	Pyramid Lake, Nevada .	Stephen Powers.
134422-134429	Baskets, gathering fruit	New Mexico	Col. Jas. Stevenson.
84139-84143	Gourds, for carrying dry articles (Moki Indians).	.....do	V. Mindeleff.
5564	Basket, gathering (Apache Indians).	Arizona	Edward Palmer.
152711	Haversack (hide)	Colima, Mexico	Do.
126680	Basket and rest stick; also head band.	.....do	Do.
126591, 126592	Carrying yoke and jars (fig. 174)...	.....do	Do.
77006	Basket, slung over the back.....	Cozumel Island.....	J. E. Benedict.
73955	Bag, packing, large	Mexico	Louis H. Aymé.
73956	Bag, packing, small .....	.....do	Do.
129652	Carrying net	Central America.....	Chas. H. Townsend.
129654	Carrying net (fig. 175).....	.....do	Do.
152507	Carrying net (fig. 184).....	Amazon River.....	Mrs. F. G. Fry.
126805	Carrying frame (fig. 176)	Honduras.....	A. E. Morlan.
1864	Wallet (Comanche Indians).....	New Mexico.....	Lieutenant Couch, U.S.A.
7926	Wallet, mat	Mexico	Dr. Sartorius.
7927	Wallet, mat (double) .....	.....do	Do.
76918-76919	Wallet, basket (palm).....	.....do	New Orleans Exposition
43121	Wallet, grass (double)	United States Colombia.	Thomas Moran.
181222	Carrying basket (fig. 181).....	Straits of Magellan	Leslie Lee.

THE CARRYING OF CHILDREN.

Next to getting about and carrying things comes the activity of carrying persons, or passenger traffic, and this commences with the transportation of helpless children.

Invention has had in this art an opportunity of elaboration along the lines of geographic conditions in obedience to the commands of ethnic peculiarities, but the most primitive method resorts to no machinery whatever. (Fig. 186.)

The traffic of the world in the present day is always numbered in

millions, whether of persons, of miles, of tons of freight carried or coal consumed, or of dollars invested. It began with naked mothers carrying naked children, without the expenditure of one dollar. To study this art from its simple to its complex forms one must commence with tropical peoples who have never been elsewhere. Here the infant is transported upon the person of the mother, both of them clinging one to the other by a semiautomatic habit or instinct. In this paper little attention will be paid to the bed and wrappings of infants. That subject has already been discussed.¹

African mothers, on the testimony of the U. S. National Museum, have never invented a single device for their tiny passengers, who are usually gathered into the folds of the sash or shawl or mantle. Doubtless this garment is worn frequently to give the child a resting place, and netting tied about the neck furnishes support to the nestling; but it is practically true that the spirit of invention in Africa has not been awakened by the necessity of carrying infants.

Schurtz figures a Masakara negro woman in the interior of Africa, grinding grain on the metate, with a muller, at the same time bearing an infant in the folds of the shawl upon her back.² And the union of the manufacturer with the carrier is one of the commonest occurrences there.

Ratzel gives an interesting picture, after Falkenstein, of a Loango mother, barefooted, wearing a head handkerchief, hoeing in the field, and carrying a sleeping infant on her back, securely held in place by a cloth or shawl, tied around her body under the arms and above the breasts, and reaching to her ankles.³

Holub, in his illustrated catalogue of the South African Exposition in Prague, pictures a Bechuana woman engaged in the same double exercise, and illustrated books and journals describing the west coast of Africa show the usual position of the African babe riding astride



Fig. 186.

WOMAN OF BRITTANY CARRYING CHILD.

From sketch by W. E. Chandlee.

¹ E. Pokrowski, *Trans. Soc. Friends of Nat. Sci.*, Moscow; Mason, "Cradles of the American Aborigines," *Rep. Smithsonian Inst. (U. S. Nat. Mus.)*, 1887, pp. 164-212; J. H. Porter, "Notes on the Artificial Deformation of Children among Savage and Civilized Peoples," *ibid.*, pp. 213-235; H. Ploss, "Das Kind in Brauch und Sitte der Völker," Leipzig, 1884, 2 vols.

² "Katechismus der Völkerkunde," Leipzig, 1893, p. 180.

³ "Völkerkunde," Leipzig, 1887, I, p. 155.

the mother's hips and enfolded in the loose garment. (Fig. 187.) In many places the attachment to her body is reduced to a mere string.

The Zulu mother carries her babe in a shawl, or wide sash, which passes around her body above her breasts, close under her arms, and reaching quite down to her hips.¹ The child sits in the shawl as in a swing, which passes about the loins above the center of gravity.

The Hottentot women generally wear the *krass*—a square piece of the skin of a wild beast, generally a wildcat, tied on with the hairy side outward—around their shoulders, which, like those of the men, cover their backs and sometimes reach down to their hams. Between two *krasses* they fasten a suckling child, if they have one, with the head just peeping over their shoulders. The under *krass* prevents their bodies being hurt by the children at their back.²

Ratzel figures Abyssinian women in the double function of carrying children and carrying freight. In the former, the tiny passenger rests in the folds of the dress on the back. In the latter, the load is borne on the back and sustained by ropes, knapsackwise.³

In European countries for the most part, the child has been consigned to a wheel carriage of some kind. The simplest form of this is the Baschkir *Kumé*, which is merely one form of California cradle (fig. 188), with wheels on the hindmost cross bar, and a hood of birch bark instead of reed mat.⁴

A forked stick is the frame of the cradle and hounds of the axle. On this rests an oblong cylinder of birch bark, ovoid in horizontal outline, and having a lattice bottom. The hood is of birch bark, and not unlike that of a common wagon.

A differentiation has also taken place among cradle frames, one form dropping the suspension strings, by means of which it became now a bed to be swung, now a vehicle to be carried, assumes the rockers or wheels and is no longer lifted from the ground; the other remains in the condition wherein it may be now a swinging bed, now a carrying frame.

The carrying of children on the person has been affected in European



Fig. 187.

AFRICAN METHOD OF CARRYING CHILD.

From a photograph in the U. S. National Museum.

¹Ratzel, "Völkerkunde," Leipzig, 1887, I, p. 150.

²Kolben, "Voyage to the Cape of Good Hope," IV, p. 14.

³"Völkerkunde," III, p. 229.

⁴Cf. Pokrowski, Rev. d'Ethnog., 1889, fig. 27, p. 34, with Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1887, p. 180, fig. 12.

countries by this differentiation. Wherever the old-time carrying frame and swing becomes a rocking cradle or a wagon, the process of carrying the child reverts to the most primitive type, chiefly on one arm, after the manner of the African mother.

The commonest sight and often a painful sight in the poorer settlements of any modern city is that of a girl, often quite young, lugging an infant on the left arm, distorting her body hopelessly.

Likewise may be seen among the folk in sport or in serious humor and in the pastimes of children survivals of past practices in the carriage of infants. In art, as has been previously stated, the drudgeries of life are glorified. If the caryatid and atlas are the æstheticising and apotheosis of burden bearing on head and back, the many renditions of the Madonna exalt in art and religion the transportation of the human infant on the left arm.¹

Hercules was cradled in his father's shield; Dionysius in a winnowing fan, which has the same shape. The Greeks do not seem to have carried children in cradles, but the Romans had gotten so far, although the figures resemble the Sioux shoe-shaped device without the wooden support.²

The Semite mother who carries her child about her neck puts it astride one shoulder, shifting it to the other as occasion demands (fig. 189). No device or invention is used, but a semi-automatic habit, a kind of instinct for clinging to each other, keeps the young passenger in position. This should be compared with the position of the child among other peoples.

In Egypt the young children of both sexes are usually carried by their mothers and nurses, not in the arms, but on the shoulder, seated astride as in fig. 190 (see Isaiah, XLIX, 22), and sometimes, for a short distance, on the hip.³ The Nestorian woman bears her child in a bundle on her back.

In the Indo-Pacific area there is little change, only local modifications

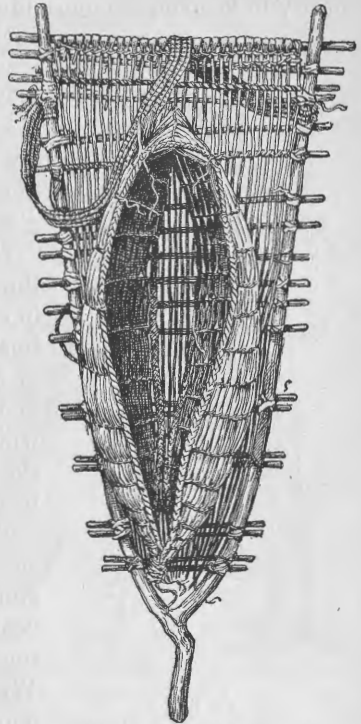


Fig. 188.
CRADLE OF RUSHES, WITH HANDLE, USED BY
KLAMATH INDIANS OF CALIFORNIA.

¹ Cf. "Woman's Share in Primitive Culture," New York, 1894, p. 186, fig. 50. Woman of India carrying burden and child.

² Smith, Dictionary of Greek and Roman Antiquities, s. v., *Cunae*.

³ Lane, "Modern Egyptians," London, 1846, I, p. 79.

in the primitive method of having as little machinery as possible involved in the transportation of the infant. Of course none of these peoples have ever so much as thought of differentiating the carriage device from the sleeping device.

The siwela, or cradle of Timor, is a flattish basket made of woven rattan ropes, suspended so as to rock over a fire placed beneath, with only the spathe of a palm under the child's back, its head generally lying on rough rattan, and with a small piece of rag thrown over its stomach. The fire below the cradle, which not unfrequently sets fire to it, is partly to keep off the mosquitoes and partly to keep the child warm during the night. The smoke is often so great as almost to suffocate the infant.¹

Turner says that the Samoan mothers carry their children not on the arm but astride the hip. He pronounces it much safer than on the back and less tiresome to the nurse, and it gives the child a least constrained posture.

The New Guinea baby may be said for some time to practically live in a net; it is carried in one suspended to the mother's neck, dangling low down in front of the woman; it sleeps in a net bag, and when it awakes and cries and can not change its position in the bag, which is probably suspended from the roof of the veranda, it presents a most comical appearance.²

The Australians of Carpentaria Gulf carry the young children under the arm, in a trough of ti bark, with a string under the center and over the shoulder, the arm pressing it on the outer side to keep it close. When a little grown, the child is carried across the hip, supported with one arm, and afterwards across the neck, holding itself on by the mother's hair.



Fig. 189.

WOMAN OF PALESTINE CARRYING CHILD.

From a sketch in the *Christian Herald*.

In South Australia, between 30 and 40 degrees south, the women carry their children on the back in the folds of the great robe, at the same time also having a satchel hung over the left shoulder and under the right arm, and paeles or rolls on the small of the back, with line across the breast and shoulders.

When a Darling River mother is about to carry her child she leans her body forward, and taking hold of the child by its arms swings it over her left shoulder and places it between her shoulder blades with its

¹ H. O. Forbes, "Ethnology of Timor-laut," *Journ. Anthropol. Inst.*, London, 1884, XIII, p. 12.

² *Journ. Anthropol. Inst.*, London, 1892, XXI, p. 203.

hands around her neck. She then throws a fur rug around herself and the child, and afterwards a netted bag (*numyuncka*) is drawn tight under the seat of the child with one end brought over each shoulder of the mother and tied together under her chin to keep the child and rug in their position; so a pouch is formed to hold the infant while it is being carried about. The men generally carry children on their shoulders, as do the Eskimo men.¹

In a photograph taken by Romyn Hitchcock at Osaka, Japan, a woman is represented as carrying a 3-year-old child pickaback (fig. 191).

The very same method of carrying is practiced by both men and women among the Eskimo of Port Clarence, Alaska.

The child's bed and carriage in one piece exists in Russia, in all the countries under her sway, and in the lands along the southern border of these. It had a wide development in America. This combination carriage and bed exists in two forms—that in which the whole body of the child is bandaged, legs and all, and that in which the body is swaddled and the legs are partly free. These two have relation to climate and pedagogic notions and superstitions; but they have profound relations also to the nomadic and hunting life of the people.

Pokrowski traces the rigid cradle wherein the child is laid upon its back and strapped therein so as often to produce deformation among the Georgians, Nogaïs, Sartes, Kirghiz, Kalmuck, Yakut, Buriat, Ostiak, and Samoyed.² He says that it is the most ancient and widely spread. In central Russia it is formed of four planks about a finger and a half high, in shape of a box, 1 meter long and 80 centimeters wide, on which is fixed a cloth bottom, and from the corners are ropes which unite in a ring above for suspension. In fact, it is a wooden hammock that has lost its carrying function. But Pokrowski affirms that these cradles often preserve the ancient form that they may be carried about as well as hung up in the house. They are both carriage and swinging cradle in one. The cords from the two borders of the cradle cross over the woman's breast as in the bandolier³ (fig. 192).



Fig. 190.

EGYPTIAN WOMAN CARRYING CHILD.

From a photograph in the U. S. National Museum.

¹F. Bonney, "Customs of the Aborigines of the River Darling, New South Wales," *Journ. Anthropol. Inst.*, London, 1884, XIII, p. 126.

²*Mém. Soc. d. Amis d. Sc. Nat.*, 1886. See also *Rev. d'Anthrop.*, 1885, p. 364; 1887, p. 238.

³*Rev. d'Ethnog.*, Paris, 1889, p. 10.

The cradle of the Lapps is a very ingenious structure, admirably suited for its purpose under the ordinary circumstances of Lapp existence. "These cradles," Friis tells us, "are hollowed out of a log, and have a hood which protects the child's head. From this hood down to the end a light network of thongs or cord is stretched over the child, and over this net a handkerchief or other covering can be spread in such a manner that the child can be in complete shelter without hindrance. A strong strap is fastened from one end of the cradle to the other, by means of which it can be slung on the back or set to swing from the branch of a tree (fig. 193). It may be thrown on the ground and rolled about without injury to the child, and it will, moreover, keep out cold of 20° below zero."¹

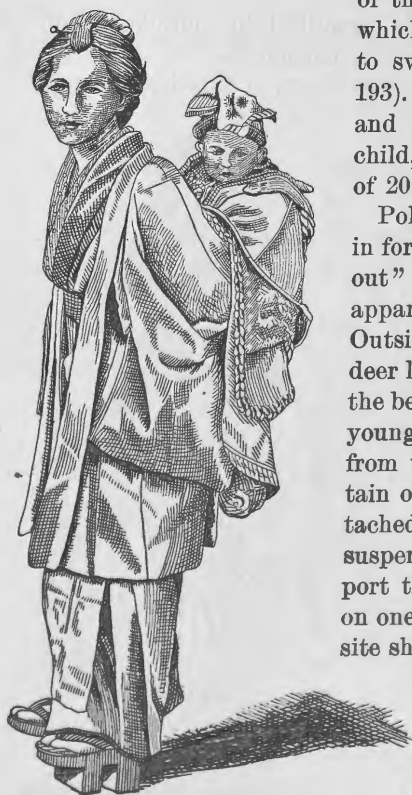


Fig. 191.

JAPANESE WOMAN CARRYING CHILD.

From a photograph by Honyu Hitchcock.

provided with cords, by means of which it may hang in front of the mother (fig. 194).

The cradle for the more advanced infant is deeper, and provides for seating it more erect. This is carried on the back of the mother (fig. 195).

The children of the Giliak, as among the Goldi, are strapped down on a kind of board serving as a cradle, and hung up in that position to

Pokrowski says that the Lapp cradle is in form of a boat, the body being a "dug-out" with very thin walls, making the apparatus very light and easy to carry. Outside is stretched a covering of reindeer leather, very thin. Moss is used for the bed, and over it is spread the fur of the young reindeer. Rawhide lines, stretched from the hood to the foot, sustain the curtain of leather hung over all. A strap attached to the foot and the front serves for suspension, and enables the mother to support the child in front or on her back, or on one hip, the strap resting on the opposite shoulder.

The Ostiak have two kinds of cradles, those for the new born and another kind for more advanced children. The former are trays of birch bark, oblong, shallow, high at the head, rolled over about the margin and decorated with great taste. The cradle is

¹ Journ. Anthropol. Inst., London, 1885, xv, p. 228.

a rafter of the hut.¹ Schrenck should also be consulted about the Giliak cradle and method of carrying the infant.²

Bush says of the Giliak cradle that near one end of the shed was a babe tightly bandaged in a wooden box or cradle, somewhat like those used by our American Indians, but with its little legs from the knees downward unfettered. This cradle was suspended from the ridge pole in an upright position, by four leather thongs that were just long enough



Fig. 192.

WOMAN OF LITTLE RUSSIA CARRYING CHILD.

From a figure in the *Revue d'Ethnographie*.

to enable the little one to reach the ground with its feet, by which it swung itself back and forth without assistance.³

Of the Samoyed cradle Jackson says:

It was amusing to see the baby, which had been sitting up and had eaten a fairly good supper of raw meat, put to bed by its mother. She first wrapped it in furs, then placed it in a box shaped like a coffin, and laced it with narrow strips of hide, so

¹ Ravenstein, "Russians on the Amur," London, 1861, p. 391.

² "Reisen und Forschungen im Amur-Lande," pl. XII.

³ Bush, "Reindeer, Dogs, and Snowshoes," p. 123.

that it was not only impossible for it to fall out, but also very difficult for it to move.¹

Infants are kept among the Mangun and Orochou in an oblong box; while the Goldi strap them down in a basin-shaped cradle, ornamented with small coins, and suspended by means of an iron hoop to a rafter in the house.²

The Yakut cradle, according to Lansdell, resembles a coal scuttle.

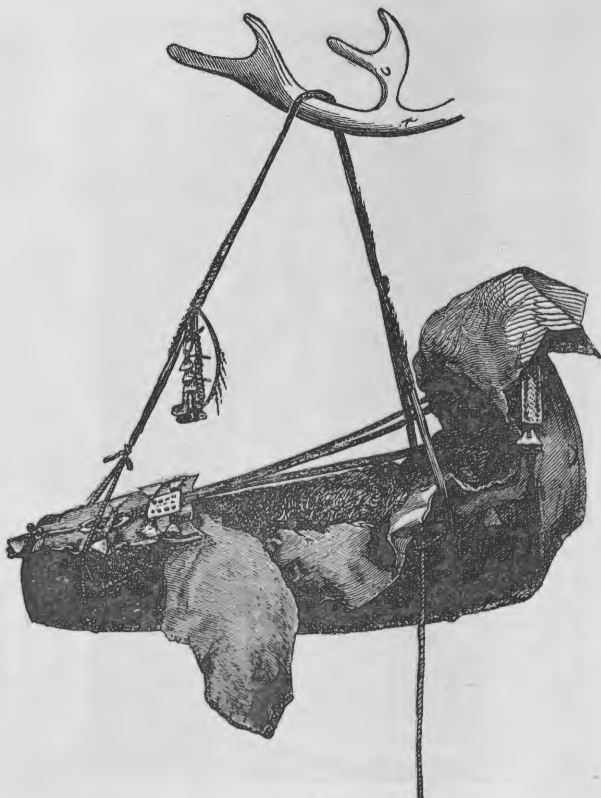


Fig. 193.

LAPP CRADLE.

From a figure in the *Revue d'Ethnographie*.

When traveling they suspend it at the side of the reindeer as the Sioux women hang their cradles from the pommel of the pony saddle.³

On the northwestern border of the Okhotsk Sea dwell the Tungus and the Lamut. They, owing to the rugged condition of their country, saddle the reindeer and use it both for riding and packing instead of

¹ F. G. Jackson, "The Great Frozen Land," London, 1895, p. 108.

² Ravenstein, "Russians on the Amur," London, 1861, p. 386.

³ Lansdell, "Through Siberia," Boston, 1882, p. 303.

draft to the sledge. The infant is neatly stowed in a cradle lined with reindeer fur (fig. 196). This cradle shuts up, and ventilation is provided through a valve of leather which the mother controls. This device may also be suspended from the human body. The Tungus, says Bush, have a novel way of carrying children on reindeer back. Two of them are lashed together and thrown over the pack saddle like two packages. Each is sewed up in a single garment, jacket, pants, boots, mittens, and cap all in one piece, made of heavy reindeer fur, with no part of them visible but the small, shining black eyes and little red noses

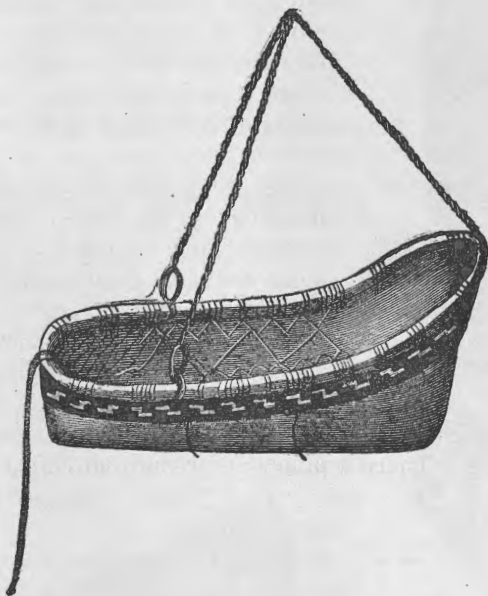


Fig. 194.

OSTIAK CRADLE.

From a figure in the *Revue d'Ethnographie*.

peering over the fur. Perchance a baby may be balanced by a kettle, etc. The youngsters do not seem to mind the cold.¹

Says N. Width:

I remember from my boyhood that the women carried their infants in a box on the back, the box well provided with reindeer skin. These boxes were fastened on poles, and when the women entered a store in the town for shopping the poles were stuck in the snow and the babies left there for hours.² * * *

In Sheldon Jackson's report on the introduction of tame reindeer into Alaska there is a native drawing of a cradle or bed for an infant, swung from the ceiling by four cords. This should be compared with

¹ Bush, "Reindeer, Dogs, and Snowshoes," New York, 1871, p. 240.

² Senate Ex. Doc. No. 73, Fifty-third Congress, second session, p. 150.

the Cape Breton and the Seminole cradle, and a photograph by Boas of the Kwakiutl.¹ The same author gives a plate showing a crowd of Chukchi; in several of the figures the children are borne pickaback, as among the western Eskimo.



Fig. 195.

OSTIAK WOMAN CARRYING CHILD.
From a figure in the *Revue d'Ethnographie*.

never placed in contact with it. There is always between the head and this hard frame or board a pillow of fur, hair, shredded bark, down, or

The author has not been able to find the cradle board or frame among the Eskimo. So far as he is informed this device does not exist in Mexico or anywhere in the tropics. If the collection of the U. S. National Museum be complete (and he is sure it is not) the cradle does not exist in either of these areas. A few general statements may be predicated upon the scanty material in the U. S. National Museum collection,

The American aboriginal cradle is influenced by climate. It can not exist in extremes of heat or cold. In one case the child would be smothered, in the other it would be frozen.

Again, whatever may be the material, whether birch bark, rawhide, a flat board, a dugout, a frame of rods, the infant's head is

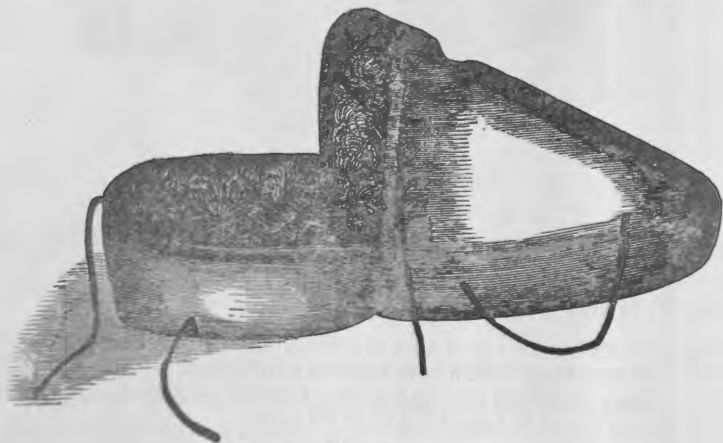


Fig. 196.

TUNGUS AND LAMUT FOLDING CRADLE.

From a figure in the *Revue d'Ethnographie*.

some other substance. It is idle, therefore, to collect cradles in order to study intentional and undesigned head flattening unless we secure

¹ Senate Ex. Doc. No. 70, Fifty-third Congress, second session, p. 101.

also the pillow. One cradle, from the Yumas, has two little pads about 4 inches apart to catch the head of the infant; another has a regular pillow, and so on.

Finally, all the U. S. National Museum cradles are made to stand up or to hang up. A great many persons who are familiar with the subject have been questioned, and it seems to be true that Indian cradles are very seldom laid flat on the ground. In that case the head is perfectly free, and after the child is a few weeks old, excepting during sleep, the head does not touch the pillow at all.

As explained elsewhere, the exigencies of climate prevent the Eskimo from carrying their children in open frames. But the Lamut and Tungus devices just named exist in a climate as cold as any endured by the Eskimo. It is necessary to seek the explanation of the absence of any device among the Eskimo in the difference of the culture grade. The Asiatics are herdsmen and hang the children to the saddlebow. The Eskimo have generally no good wood for frames and no good reason to separate the infant from the mother. When the child is young it rides in the mother's hood, between her fur coat and her skin (fig. 197). To prevent the young passenger from getting lost Boas intimates that a strap is worn about the mother's waist. The costume of this unique people over many hundreds of miles of coast east and west is uniform in this regard.¹

When children are about a month old they are put into a jacket made from the skin of a deer fawn having a cap of the same material, their legs remaining bare, as they are always carried in their mother's hood. In some places, where large boots are in use, they are said to be carried in these.²

The hood of the jacket is much the larger in that of the women, for the purpose of holding a child. The back of the jacket also bulges out in the middle to give the child a footing, and a strap or girdle below this, secured round the waist by two large wooden buttons in front, prevents the infant from sliding down.³

The mode of treating infants is one of the national customs of a people that changes most slowly says Richardson.⁴

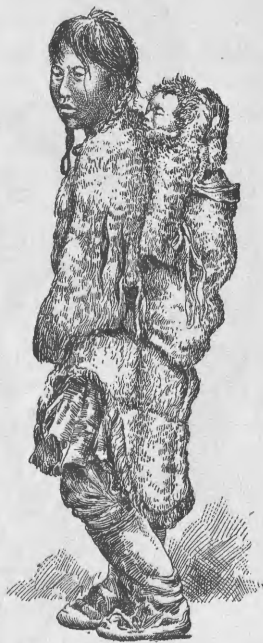


Fig. 197.

ESKIMO WOMAN OF POINT BARROW
CARRYING CHILD.

From a photograph by Captain Healy,
U. S. R. M.

¹ Sixth Ann. Rep. Bureau of Ethnology, p. 556.

² Ibid, p. 556.

³ Ibid, p. 557.

⁴ Richardson, "Arctic Searching Expedition," New York, 1852, p. 218.

Peary says that the woman of North Greenland, like the man, wore the ahtee and netcheh, made respectively of bird skin and sealskin. They differed in pattern from those of the man only in the back, where an extra width is sewed in, which forms a pouch extending the entire length of the back of the wearer and fitting tight around the hips. In this pouch or hood the baby is carried; its little body, covered only by a shirt reaching to the waist, made of the skin of a young blue fox, is placed against the bare back of the mother, and the head, covered by a tight-fitting skull-cap made of seal skin, is allowed to rest against the mother's shoulder. In this way the Eskimo child is carried



Fig. 198.

ESKIMO WOMAN CARRYING CHILD.

From a photograph in the Bureau of Ethnology.

constantly, whether awake or asleep, and without clothing except the shirt and cap, until it can walk, which is usually at the age of 2 years; then it is clothed in skin and allowed to toddle about. If it is the youngest member of the family, after it has learned to walk, it still takes its place in the mother's hood whenever it is sleepy or tired, just as American mothers pick up their little toddlers and rock them.¹

When the Eskimo babe is large enough to escape from the hood and walk it has still to be carried a great deal. Of this sort, both father and mother take the youngster by one arm and one leg, give it a toss, and in a twinkling the youthful rider is sitting pickaback astride the parent's neck (fig. 198). The author has seen both men and women carrying young children after this fashion.

Women carry their young astride their backs. The child is held in place by a strap passing under its thighs and around over the mother's breasts.²

When a child is born in Ungava, on the authority of Lucien Turner, the mother wraps it in the softest skin she is able to procure and during its infancy it is carried in the ample hood attached to her coat.

The carrying devices for infants among the American Indians, as

¹ J. Peary, "My Arctic Journal," New York and Philadelphia, 1893, p. 43.

² John W. Kelly, "Ethnographical Memoranda Concerning the Arctic Eskimos of Alaska and Siberia," Bureau of Education, Circular of Information No. 2, 1890, p. 18.

distinguished from the Eskimos, may now be examined in the following families and tribes: (1) The Athapascan family, of Alaska and Canada; (2) the Algonquian family, of Canada and the United States; (3) the Iroquoian family, north to south; (4) the Southern Indians of the United States; (5) the tribes of the plains of the Great West, especially the Siouan family; (6) the Pacific Slope tribes of southeast Alaska and British Columbia; (7) the tribes of the Pacific Slope from Vancouver Island southward; (8) the Great Interior Basin and the Pueblos; (9) Mexico and Central America; (10) the Cordilleras of South America; (11) the Amazonian area and southward; (12) the Caribbean area.

The Athapascans of the north are the inland neighbors of the Eskimo and by the Rev. A. G. Morice are thus classified:

Northern Dénés.—Loucheux: Lower Mackenzie River and Alaska; Hares: Mackenzie, Anderson, and MacFarlane rivers; Bad-People: Old Fort Halkett; Slaves: west of Great Slave Lake and Mackenzie River; Dog-Ribs: between Great Slave Lake and Great Bear Lake; Yellow-Knives: northeast of Great Slave Lake; Cariboo Eaters: east of Lake Athabaska; Chippewayans: Lake Athabaska, etc.; Tsé'kéhne: both sides of Rocky Mountains; Beavers: south side of Peace River; Sarcees: east of Rocky Mountains, latitude 51° north; Nah'ane: Stickeen River and east; Carriers: Stuarts Lake, north and south; Tsilkoh'tin: Chilcotin River.

Southern Dénés.—Umkwás, Totunies, and Kwalhiokwas: Oregon; Hupas: Hupa Valley, California; Wailakis: northern California; Navajo: Arizona; Apache: Oklahoma, Colorado, New Mexico, and Arizona; Lipans: New Mexico.

Mackenzie somewhere intimates that the Chippewayan mothers make their upper garments full in the shoulders. When traveling they carry their infants upon their backs next the skin and convenient to giving them nourishment. This is a transition habit between Eskimo and Indian and not prevalent among the Athapascans.

"The Kutchin women," says Richardson, "do not carry their infants in their hoods or boots after the Eskimo fashion, nor do they stuff them into a bag with moss, as the Chippewayan and Crees do, but they place them in a seat of birch bark, with back and sides like those of an armchair, and a pommel in front resembling the peak of a Spanish saddle. This hangs at the woman's back, suspended by a strap which passes over her shoulders, and the infant is seated in it, with back to hers, and its legs, well cased in warm boots, hanging down on each side of the pommel. The child's feet are bandaged to prevent their growing, small feet being thought handsome; and the consequence is that short, unshapely feet are characteristic of the people."¹

The Lower Yukon trough-shaped cradle of birch bark (example No. 32986, in the U. S. National Museum, fig. 199) is made of three pieces, the

¹ Richardson, "Arctic Searching Expedition," New York, 1852, p. 227.

bottom, the top or hood, and the awning piece. The two parts constituting the body of the cradle overlap an inch and a half and are sewed together with a single basting of pine root, with stitches half an inch apart. Around the body just under the margin, and continuously around the border of the hood and awning, lies a rod of osier. A strip of birch bark laid on the upper side of the awning serves as a stiffener and is sewed down by an ingenious basting with stitches an inch or more long which pass down through two thicknesses of birch bark, around the osier twig just below the margin, and up again through the two

thicknesses of birch bark by another opening to form the next stitch. The hood is formed by puckering the birch bark after the manner of a grocer's bag. The bordering osier is neatly seized to the edge of the hood and awning by a coil of split spruce root. Rows of beads of many colors adorn the awning piece. In a country intolerable by reason of the mosquitoes it is not strange that provisions for sustaining some sort of netting should be devised.

Immediately after birth, without being washed, the Northeastern Tinneh infant is laid naked on a layer of moss in a bag made of leather and lined with hare skins. If it be in summer, the latter is dispensed with. This bag is then securely laced, restraining the limbs in natural positions, and leaving the child freedom to move the head only. In this phase of its existence

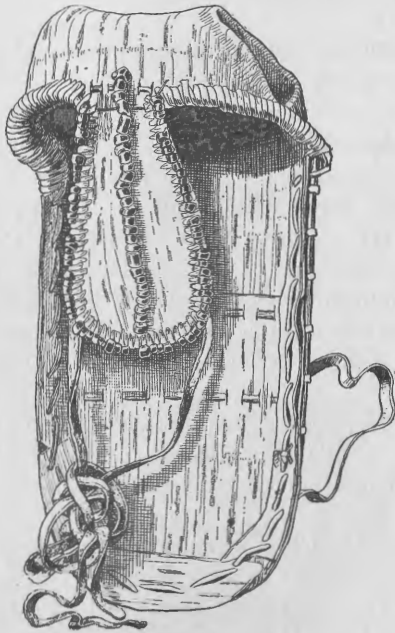


Fig. 199.

ATHAPASCAN CRADLE OF BIRCH BARK.

Yukon River, Alaska.

Cat. No. 32986, U. S. N. M. Collected by E. W. Nelson

it resembles strongly an Egyptian mummy. Cradles are never used, but this machine, called a "moss bag," is an excellent adjunct to the rearing of children up to a certain age, and has become almost, if not universally, adopted in the families of the Hudson Bay Company's employees.¹

The Carrier women of Stuart Lake transported their babes in cradles of birch bark, curved up at the narrow end or foot and prolonged at the broad or open end as a support for the child's head. A hoop of willow encircled the wide end, and the necessary lacings passed through a band of buckskin bordering the apparatus on the outside. In recent times modifications have been made in covers and in lacings. The Tsilkoh'tin tribe make a cradle of willow twigs in form of a slipper, covered with

¹Bernard R. Ross, Rep. Smithsonian Inst., 1866, p. 305.

deerskin and provide a hoop over the infant's face.¹ In this connection especial attention is called to the Yokaia and the Hupa cradles of California. The shoe-shaped cradle of the Tsilkoh'tin resembles in form and motif the latter, the Carrier truncated cradle, in which the child's feet are free, recalling the former, even as to the material.² The reader will not forget that the Hupa came long ago to California from the Athapascan country.

The Southern Canadian cradle is a board with two flaps of cloth which lace together up the center. The child is laid on its back on the board, packed with soft moss, and laced firmly down with its arms to its side and only its head at liberty. The cradle is strung on the back of the mother when traveling, or reared against a tree when resting in camp, the child being only occasionally released from bondage for a few moments. The little prisoners are remarkably good. No squalling disturbs an Indian camp.³

Catlin figures a Cree woman carrying a child on her right arm, and holding the buffalo robe around the child with the left hand.⁴ The Kickapoos, of the same stock, carry the small child on the back in the shawl (fig. 200).

Mr. Lucien Turner reports that the Nascopi of Labrador and Ungava, who are much affected by their proximity to Eskimo, use no cradle board for children.

The principal factor in the Chipewewa infant's house, according to Kohl, is a flat board. For this purpose poplar wood is selected; in the first place because it is light, and secondly, because it does not crack



Fig. 200.

KICKAPOO (ALGONQUIAN) WOMAN CARRYING CHILD.
After Hoppe.

or splinter. On this board a small frame of thin, peeled sapling is fastened, much after the shape of the child's body, and stands up from the board like the sides of a violin from the sounding board. It is fastened on with bast, because the Indians never use nails, screws, or glue. The cavity is filled with very soft substances for the reception of the child.

¹ Cf. A. G. Morice, *Trans. Canadian Inst.*, 1894, IV, p. 133, with two figures.

² See figures 210-212.

³ Fitzwilliams, "The Northwest Passage by Land," p. 85.

⁴ Catlin, "North American Indians," I, p. 33.

They prepare for this purpose a mixture composed of very fine, dry moss, rotted cedar wood, and a species of tender wool found in the seed vessels of a species of reed. This wool was recommended as a most useful ingredient in the stuffing, for it sucks up all moisture as greedily as a sponge, and hence there is no need to inspect the baby continually. In this bed the little beings nestle up to the armpits—so far they are wrapped up tightly with bandages and coverings, but the head and arms are free. At a convenient distance above the head is a stiff circle of wood, also fastened to the cradle with bast. It serves as a protection to the head, and if the cradle happens to fall over it rests on this arch. In fact, you may roll an Indian tikinagan over as much as you please, but the child can not be injured. The squaws at times display extraordinary luxury in the gaily embroidered coverlid which they throw over the whole cradle.¹

The Iroquois cradle, example No. 18806, has the backboard carved in imitation of peacocks and is painted in bright colors. It is square at the top and the awning frame is mortised at the ends, which allows them to slide over the awning bar held down and guyed by stays on the opposite sides; has a movable foot rest at the bottom and thongs along the sides for lashing the baby in. Length, $29\frac{1}{4}$ inches; width, top, $10\frac{1}{2}$ inches, bottom, $8\frac{1}{2}$ inches; foot rest, height, $3\frac{1}{2}$ inches; width, 6 inches. The St. Regis Iroquois, in the north of New York and near Canada, have for many years bought their cradle boards from the whites or made them of material bought from a white man.

Example No. 8894 is like the last, with gaudily painted and carved backboard, and awning frame carved. Length, 31 inches; width, top 11 inches, bottom $7\frac{3}{4}$ inches; height of awning frame, $12\frac{1}{4}$ inches; width of top $9\frac{1}{2}$, bottom 12 inches.

Morgan says that the Iroquois baby frame, "ga-ose-ha," is an Indian invention. It appears to have been designed rather as a convenience to the Indian mother for the transportation of her infant than, as has generally been supposed, to secure an erect figure. The frame is about 2 feet in length by about 14 inches in width, with a carved footboard at the small end and a hoop or bow at the head, arching over at right angles. After being inclosed in a blanket, the infant is lashed upon the frame with belts of beadwork, which firmly secure and cover its person, with the exception of the face. A separate article for covering the face is then drawn over the bow, and the child is wholly protected. When in use, the burden strap attached to the frame is placed around the forehead of the mother, and the "ga-ose-ha" upon her back. This frame is often elaborately carved, and its ornaments are of the choicest description. When cultivating the maize, or engaged in any outdoor occupation, the mother hangs the "ga-ose-ha" upon a limb of the nearest tree and left to swing in the breeze. The patience and quiet of the

¹ J. G. Kohl, "Wanderings round Lake Superior," 1860, pp. 6-7.

Indian child in this close confinement are quite remarkable. It will hang thus suspended for hours without uttering a complaint.¹

East of the Mississippi River, north of the Tennessee and the North Carolina line, and south of Hudson Bay Algonquian and Iroquoian tribes all used a flat cradle board not far from 2½ feet long, 10 inches wide, and one-half an inch thick, tapering wider at the head. Example No. 18806 has the back carved in flowers and birds and painted blue, red, green, and yellow. The cleat at the upper end of the back is a modern chair round. The footboard is a small shelf or bracket on which the child's feet rest.

"In the towne of Dafemonquepeuc distant from Roanoac 4 or 5 milles, the woemen are attired, and powned, in fuch forte as the woemen of Roanoac are, yet they weare noe worathes vppon their heads, nether haue they their thighes painted with fmall pricks. They haue a ftrange manner of bearing their children, and quite contrarie to ours. For our woemen carrie their children in their armes before their brefts, but they taking their fonne by the right hand, bear him on their backs, holdinge the left thighe in their lefte arme after a ftrange and conuefnall fafhion."²

Hodgson's description is not clear. He says that as few of the Creeks are able to purchase many negroes, almost all the drudgery is performed by the women, and it is melancholy to meet them, as we continually did, with an infant hanging on their necks, bending under a heavy burden and leading their husband's horse while he walked before them, erect and graceful, apparently without a care. This servitude has an unfavorable effect upon the appearance of the women, those above a certain age being generally bent and clumsy, with a scowl on their wrinkled forehead and a countenance dejected.³

The Chetemacha of St. Marys Parish, southern Louisiana, had a peculiar method of fastening their infants in the cradle boards. They rocked them in such a way that the forehead was flattened, while the back of the head assumed a round shape by the rocking motion. This implies that the flattening pad, or short piece of wood, was fastened to the head only and not at the same time to the cradle board.⁴ It also points to a fashion of cradling or carrying of that type which exists from the Columbia River mouth northward. The Choctaw custom should be studied in the same connection.

The frame of the Comanche cradle (Shoshonean) belongs to the latticed type, as in figure 202, and is thus made: Two strips of narrow

¹ Lewis H. Morgan, "League of the Iroquois," 1851, pp. 390-391, with illustration.

² Hariot, "Virginia," Holbein Soc., Manchester, 1888, pl. x.

³ Hodgson, "Letters from North America," I, pp. 135-136. Compare the hammock cradle of the Seminoles (Fifth Ann. Rep. Bureau of Ethnology, p. 497) with Cape Breton cradle (Rep. U. S. Nat. Mus., 1887, p. 169) and drawing in Bruce's report. (Senate Ex. Doc. No. 73, Fifty-third Congress, second session.)

⁴ Gatschet, Trans. Anthropol. Soc., Washington, 1884, II, p. 153.

board, often native hewn, wider and farther apart at the upper end, are held in place by crosspieces lashed on so as to accommodate the leather cradle sheath. The lashing is very ingeniously done. Four holes an inch apart are bored through the frame board and the cross-

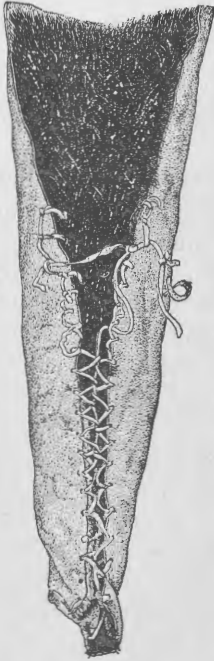


Fig. 201.

COMANCHE CRADLE OF BEAR-SKIN.

Cat. No. 6970, U. S. N. M. Collected by Edward Palmer.

pieces at the corners of a square. A string of buckskin is passed backward and forward from hole to hole and the two ends tied, or one end is passed through a slit cut in the other. The lashing does not cross the square on either side diagonally. Above the upper crosspiece the frame pieces project a foot and are sharpened on top like fence pickets. Disks of German silver and brass-headed nails are used in profusion to form various geometric ornaments. Upon the front of the frame, between the crosspieces, a strip of buffalo hide (with the hair side is sewn with rawhide strings toward the cradle bed). The inclosing case is a shoe-shaped bag made of a single piece of soft deerskin lashed together halfway on top in the usual manner, and kept open around the face by a stiffening of buffalo leather. This case is attached to the frame by thong lacings. Little sleigh bells, bits of leather, feathers, etc., complete the ornamentation.

Another Comanche example, No. 6970 (fig. 201), is the most primitive cradle in the U. S. National Museum. It is a strip of black bearskin, 30 inches long and 20 wide, doubled together in form of a cradle case. Along the side edges loops of buckskin are made to receive the lacing. The loops are formed as follows: A buckskin string is passed through a hole in the bearskin, and the longer end passed through a slit or cut in the shorter end. The long end is then passed through the next hole and drawn until a loop of sufficient size is left; a slit is made in the string near the last hole passed through, and then the whole lashing is drawn through this slit. This serves the purpose of a knot at each hole, as in many other cradles. A foot piece of bearskin is sewed in with coarse leather string.

The Blackfeet Indian women of Montana carried their more advanced

cradles. The inclosing case is a shoe-shaped bag made of a single piece of soft deerskin lashed together halfway on top in the usual manner, and kept open around the face by a stiffening of buffalo leather. This case is attached to the frame by thong lacings. Little sleigh bells, bits of leather, feathers, etc., complete the ornamentation.

Another Comanche example, No. 6970 (fig. 201), is

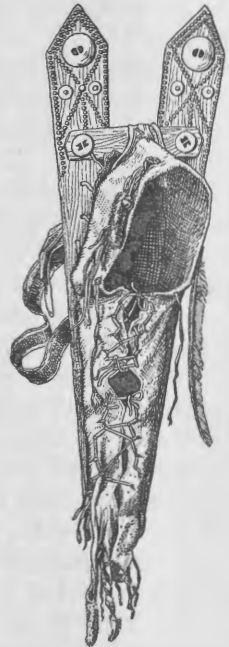


Fig. 202

TRELLIS CRADLE USED BY THE BLACKFEET INDIANS OF MONTANA.

Cat. No. 6919, U. S. N. M. Collected by Edward Palmer.

children in their arms or in a robe behind their backs. When traveling the children were placed in sacks of skin on the tent poles. No cradle of any form was seen.¹ Maximilian also tells of a Minitaree woman who carried a little child wrapped in a piece of leather fastened with straps.² This occurrence of a frameless cradle in three spots east of the Rocky Mountains lends color to the statement that the introduction of the horse greatly modified the method of carrying infants.

Among the relics of the Catlin collection are two old cradles. Of one the following description will suffice: Backboard square at the top; carved and painted; awning frame bent and painted; covering cloth decorated with beads and tacked around the edge of the side board, brought up and laced in the middle like a shoe; length, 28 $\frac{3}{4}$ inches; width, 13 inches.

The description of the second example (fig. 203) is as follows: Backboard carved on front above; back brace with large, rounded ends extending outward; foot rest low, curved around at the bottom; cradle covered over with quill work in red, white, and black patterns—lozenges, women, horses, etc.; decorated with iron bells; opening across the cradle covered in the middle with embroidered quilt; length, 31 $\frac{1}{2}$ inches; width, 10 $\frac{3}{4}$ inches; head frame, 9 $\frac{1}{2}$ inches; height, 13 $\frac{3}{4}$ inches.³

A plate from Catlin in the Report of the National Museum for 1885, is most significant. Here the Sioux woman carries a helpless infant in a cradle, laced

down, feet and all. A second has an older child on her back infolded in her blanket. Further on the scene is changed. It is the epoch of the horse, and both women seem to be lifted from the ground bodily without changing the positions of their burdens. (Fig. 204.)

Example No. 75472 is an Ogallala Sioux cradle. The frame is made of two diverging slats painted yellow, held in place at the head and



Fig. 203.

ALGONQUIAN CRADLE, DECORATED WITH QUILL WORK.

Collected by George Catlin.

¹ Stevens, Ann. Rep. Ind. Affairs, 1854, p. 204.

² "Travels in the Interior of North America," London, 1843, p. 180.

³ Rep. Smithsonian Inst. (U. S. Nat. Mus.) 1887, p. 202.

foot by cross slats lashed as in the Blackfeet cradle, with this difference, namely, that the string crosses between the holes diagonally.

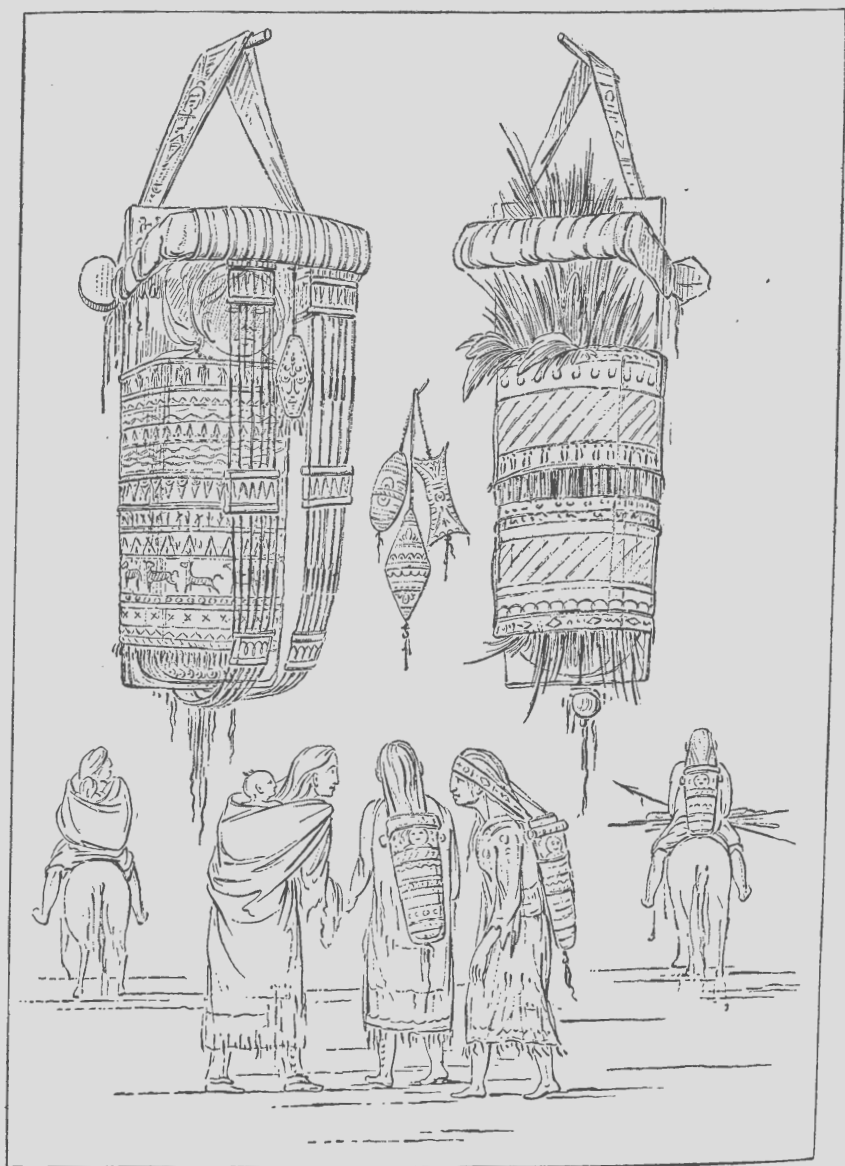


Fig. 204.

ALGONQUIAN CRADLES IN USE.

From a figure in the Report of the Smithsonian Institution (U. S. National Museum), 1885.

This may have no significance. The tops of the side piece project above the cradle sack at least 18 inches, and are studded with brass-

headed nails in straight lines. As in the Blackfeet cradle, there is a bottom or mattress, but a quilt of calico, lined, supplants the buffalo hide. The baby case proper is shoe shaped, the part around the head and shoulders stiffened with a lining of buffalo leather. All over the outside beadwork is laid on in geometric patterns of blue, red, yellow, green, and blue black on a white ground. The beads are strung on a fine sinew thread in proper number and color to extend quite across the case. This string is then tacked down at intervals of three-fourths of an inch so regularly as to form continuous, creased lines extending from the foot longitudinally around the baby case to the foot on the other side to imitate porcupine-quill work. Streamers of colored tape and ribbon take the place of old-fashioned fur and feathers. The edges of the lower half of the case are joined by four strings tied separately, instead of the universal lashing. There are about this cradle several marks of modification by contact with whites, which show at the same time the tenacity with which old forms remain and readiness with which they yield to pressure at the points of least resistance, indicating also where the points of least resistance are.

The Dakotas had ornamented frames for cradles, to which they fastened the child with leather straps, one passing over the head, the other over the middle of the body. The workmanship of these leather straps was remarkably neat and curious, they being entirely covered with a ground of milk-white porcupine quills, on which figures of men, of a vermilion color, and black figures of dogs and other similar patterns, were most tastefully embroidered, and all of the most lively and well-chosen colors.¹ (Fig. 205.)

In another Sioux tent Maximilian found a child hung up in a leather pouch of very beautiful workmanship. These nests, which serve instead of cradles, were so large that only the child's head was visible. This pouch had on the upper side two broad stripes of dyed porcupine quills and several pretty rosettes with long strings of different colors, and was lined with fur.²

The Naudowessi women, according to Carver, placed their children soon after they were born on boards stuffed with soft moss, such as



Fig. 205.

TRELLIS CRADLE OF THE OGALLALA SIOUX INDIANS.

Cat. No. 75472, U. S. N. M.

¹ Maximilian, "Travels in the Interior of North America," p. 157.

² *Ibid.*, p. 204.

is found in morasses or meadows. The child was laid on its back in one of this kind of cradles, and, being wrapped in skins or cloth to keep it warm, was secured in it by small bent pieces of timber. To these machines they fastened strings, by which they hung them to branches of trees; or, if they found no trees at hand, fastened them to a stump or stone while they transacted any needful business. In this position the children were kept for months, when they were taken out.¹

As soon as the Sioux Indian baby is born, says Dodge, it is placed in a coffin-shaped receptacle, where it passes nearly the whole of the first year of its existence, being taken out only once or twice a day for washing or change of clothing. This clothing is of the most primitive character, the baby being simply swaddled in a dressed deerskin or piece of thick cotton cloth which envelops the whole body below the neck. The outside of the cradle varies with the wealth or taste of the mother, scarcely two being exactly alike. Some are elaborately ornamented with furs, feathers, and beadwork; others are perfectly plain. Whatever the outside, the cases themselves are nearly the same.

A piece of dried buffalo hide is cut into proper shape, then turned on itself, and the front fastened with strings. The face of the babe is always exposed. The whole is then tightly fastened to a board or, in the most approved cradles, to two narrow pieces of board joined together in the form of a ladder. It forms a real "nest of comfort," and as the Indian is not a stickler on the score of cleanliness, it is the very best cradle that they could adopt. To the board or slats is attached a strap which, passed over the head, rests on the mother's chest and shoulders, leaving the arms free. When about the lodge-the mother stands the cradle in some out-of-the way corner, or in fine weather against a tree; or if the wind is blowing fresh it is hung to a branch, where it fulfills all the promise of a nursery rhyme.

When the baby is 10 months to a year old it is released from its confinement and for a year or two more of its life takes its short journeys on its mother's back in a simple way. It is placed well up between the shoulders; the blanket is then thrown over both, and being drawn tightly at the front of her neck by the mother, leaves a fold behind, in which the little one rides securely and apparently without the slightest inconvenience to either rider or ridden. A Nez Percé woman may be seen playing a vigorous game of ball with a baby on her back.²

Examining a collection of cradles from the United States east of the Rocky Mountains, the student is at a loss to harmonize the object with the old descriptions. Often the traveler speaks of a board being used, and this is true for cradles east of the Plains, or where timber abounds, but on the Plains the cradle is backed by lattice work, with sharp ends

¹ Carver, "Three Years' Travels," Philadelphia, 1796, p. 151.

² Dodge, "Our Wild Indians," Hartford, 1883, Worthington, pp. 185-186.

projecting upward. Of course, aboriginally, there was no board cradle back, and even the modern nicely planed slats were unknown.

On the Pacific Slope of America, between Mount St. Elias and Puget Sound, are the following great stocks of Indians:

1. *Koluschan or Tlingit*.—Including Auk, Chilcat, Hanega, Hood-sunu, Hunah, Kek, Sitka, Stahkin, Tagish, Taku, Tongass, and Yakutat.
2. *Skittagetan*.—Called also Haida.
3. *Chimmesyan*.—The Nasqa and Tsimshian of Boas.
4. *Wakashan*.—Aht and Haeltzuk tribes.
5. *Salishan*.—In British Columbia, Washington, and Montana.

The Tlingit have three forms of cradle. The first is a simple piece of bark curled up, and the very young child is securely lodged therein. The second is made of a backing of hard substance, basketry, etc., and the front is a close curving or boot of sealskin or some other warm fur. The third is the trough-shaped variety seen farther south. Both in the matter of form and of carrying appliances the Pacific Slope cradles are to be compared with northern forms of the Eastern Continent. Especially to be noted are the four guys or strings from the upper border of the trough or the basket instead of or in addition to the headband at the back. Furthermore, on this coast are both forms with reference to the feet, that in which they are lashed down and that in which they are free, but the free form is doubtless the older.

The situation of the Tchinkitanayan (*Koluschan*) children at the breast, says Marchand, is, however, deplorable. They are packed up in a sort of wicker cradle, somewhat like one of our chairs, the back of which has been cut at a small height above the seat. The cradle is covered outwardly with dry leather and lined with furs in the place where the child is to rest. Placed in a sitting posture, with its legs extended and stuck one against the other, it is covered to the chin by an otter skin and tied down in order to fix it on its bed of pain by leather straps which leave it no liberty except for the motions of its head. Care is taken to cover the seat on which it rests with dry moss, and some of the same material is placed between its thighs.¹

Example No. 20556 is a *Bella coola* cradle (fig. 206*a*), consisting of a trough-shaped frame made of two pieces of giant cedar, as follows: The bottom and headboard are in one piece, about one-half to three-fourths of an inch thick, and the two sides and foot are in one piece. The angles and the bends near the child's knees are effected by scarfing the wood almost through on the inside and boiling and bending it into shape. In this art these Indians are very expert, making great numbers of boxes for food and clothing with joints invisible on the outside.

The joints of this cradle are united by means of small withes of willow. Characteristic marks are the flat bottom; headboard like a little gravestone, painted in red and black, with conventional symbol of a

¹ Marchand, "Voyage Around the World," London, 1801, 1, p. 262. Cf. figs. 195 and 211.

totem; two streaks of red paint on the upper margin of the sides; the change in the angle of convergence near the child effected by scarfing and bending the sides.

The bed consists of a mass of finely-shredded cedar bark. This is overlaid with some kind of cloth or fur, and the lashing passes through holes in flaps of rawhide, in place of the series of eyelet loops occurring on cradles farther south.

The Wakashan child lies at full length and the sides of the cradle are sufficiently high to enable the mother to lace it in by a cord passed

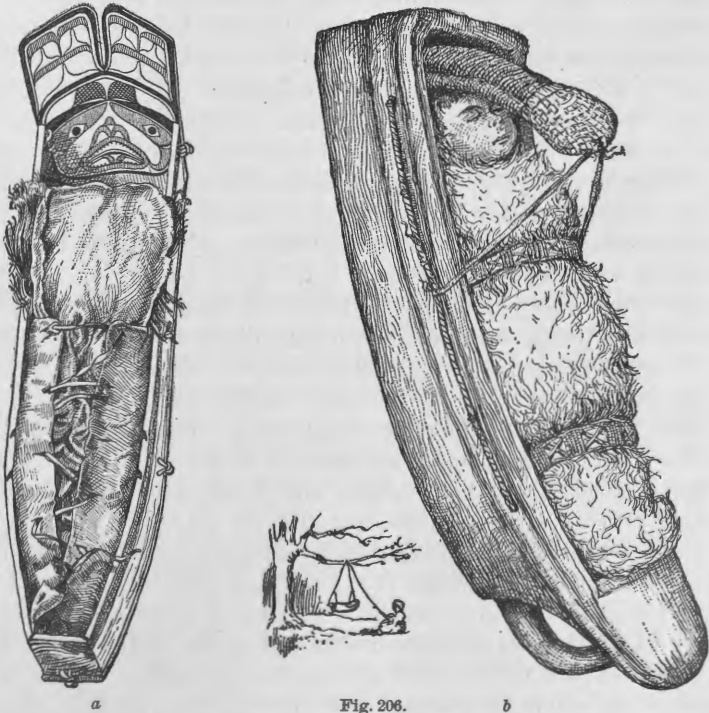


Fig. 206.

CRADLES FROM THE NORTH PACIFIC COAST.

(a) Cat. No. 20556, U. S. N. M. Bella Coola (Salishan) Indians. Collected by J. G. Swan.

(b) Cat. No. 2574, U. S. N. M. Chinook Indians. Collected by Lieutenant Wilkes.

from side to side, a small block being put at one end as a pillow. When the mother is traveling she carries the cradle on her back in nearly an upright position with the head appearing just above her shoulders, but if she is working she suspends the infant from a pliant branch of a tree, or sticking a pole in the ground at a slight angle hangs the cradle, sometimes upright, sometimes horizontally, on the end of it. She moves pole and cradle so as to keep it near her and every now and then gives the latter a swing so that it rocks up and down. It is said that when children die they are put in some lake or pool in their cradles and left to float, the water being regarded as sacred ever after.¹ Especial

¹ Mayne, "British Columbia and Vancouver Island," p. 303.

attention is called to the double method of suspending the cradle, though there may be only one way of carrying it. Dr. Boas has sent to the U. S. National Museum three photographs of the cradles of the Kwakiutl or Fort Rupert Indians of this stock, and in each of them the mother has suspended the object horizontally from a bough and is rocking it by means of a string with the hand or the toe.

As soon as a Similkameen child in British Columbia can sit alone it is placed on horseback, indeed before that it becomes familiarized with horses, for while a child is still bound on a "papoose stick," it is hung by a strap to the pommel of its mother's saddle, and away it goes flying with her over the bunch-grass hills, and they thus make good riders, with firm, easy, graceful seating.¹

The Twana in Washington State have no cradles, but for young infants they have a small board about the length of the child, on which they place cedar bark, which is beaten up very fine, and on this they tie the child a large portion of the time. When the child is a little older but not strong enough to hold on its mother's neck, she wraps a blanket or shawl around it and herself and thus carries it on her back.

The cradle often lies down, but sometimes is hung on a small stick, a few feet high, which is fastened in the ground or floor, in a slanting direction, and acts as a spring. A string is fastened to it, and the mother pulls the string, which keeps the stick constantly moving and the cradle and child constantly swinging. This is done with the bare foot when the hands are busy at work.²

Example No. 1043 in the U. S. National Museum is a cradle trough rudely hewn out of cedar wood. A low bridge is left across the trough to strengthen it. Slats are put across to the level of the height of the bridge. The bedding is mats of cedar bark. On the lower end of the cradle is a handle. Around the sides are fastened strings. The compress for the head is fastened by means of cords to the sides of the cradle. It is woven of root and straw and stuffed tightly with cedar bark. In the cradle is a wooden model of a baby undergoing the process of head flattening. The covering is a cedar mat.

Length, 26 inches; width in the middle, $8\frac{3}{4}$ inches; length of end, 5 inches; upper, $6\frac{1}{2}$ inches; depth, $4\frac{1}{4}$ inches; length of head compress, 10 inches; width of the stem, 3 inches expanded; end, $3\frac{3}{4}$ inches. Collected by J. G. Swan.

Example No. 1044 is a similar trough (empty).

The cradle of the Makah Indians, the most southern extension of the Wakashan stock, at Cape Flattery, Washington, is the cedar trough or ark prevalent further north and a little southward. Swan collected cradles from this tribe and conveys the important information that they are suspended horizontally by strings reaching from four corners to a

¹ Mrs. Allison, Journ. Anthropol. Inst., London, 1892, xxi, p. 306.

² M. Eells, Bull. U. S. Geol. and Geog. Surv., 1877, pp. 3, 68, 102.

pliant pole, and that is swung or rocked by the mother with her hand, or, if she be engaged at work, she does the rocking with her great toe.¹

As soon as a Makah child is born it is washed in warm urine and then smeared with whale oil and placed in a cradle made of bark, woven basket fashion, or of wood, either cedar or alder, hollowed out for the purpose. Into the cradle a quantity of finely separated cedar bark of the softest texture is first thrown. At the foot is a board raised at an angle of about 25° which serves to keep the child's feet

elevated or, when the cradle is raised, to allow the child to nurse, to form a support for the body or a sort of a seat. This is also covered with bark, he-se-yu. A pillow is formed of the same material just high enough to keep the head in its natural position, with the spinal column neither elevated nor depressed. First the child is laid on its back, its legs properly extended, its arms put close to its sides, and a covering either

of bark or cloth laid over it, and then, commencing at its feet, the whole body is firmly laced up, so that it has no chance to move in the least. When the body is well secured a padding of he-se-yu is placed over the child's forehead, over which is laid bark of a somewhat stiffer texture, and the head is firmly lashed down to the sides of the cradle. Thus the infant remains, seldom taken out more than once a day while it is very young, and then only to wash it and



Fig. 207.

NEZ PERCÉ (SHAHAPTIAN) CRADLE.

Cal. No. 23840, U. S. N. M. Collected by J. B. Monteith.

dry its bedding. The same style of cradle appears to be used whether it is intended to compress the skull or not, and that deformity is accomplished by simply drawing the strings of the head-pad tightly and keeping up the pressure for a long time. Children are usually kept in these cradles till they are a year old, but as their growth advances they are not tied up quite so long for the first few months. The mother in washing her child seldom takes the trouble to heat water; she simply fills her mouth with water and when she thinks it warm enough spirts it on the child and rubs it with her hand. If the infant be very dirty, a wash of stale urine is used, which effectually removes the oil and dirt.²

¹ J. G. Swan, "Indians of Cape Flattery," Washington, 1869, pp. 7-18.

² *Ibid.*, pp. 18-19.

A cradle box and doll in the Emmons Tlingit collection illustrates what is meant by leaving the feet free. It is a coffin-shaped box, with sides curved out, headboard elevated, and a false bottom board that has one end under the child's thighs and the other cocked up on the top of a wooden image representing a man's head. The child is wrapped in fur, its face and feet bare.

In the same collection is a Kawitchin (Salishan) basket cradle. Seventeen strips of wood form the warp of the bottom. These are covered with coiled weaving of split bark. The sides and ends of the cradle are similarly made and are eight strips high. The edge consists of a narrow beading. The upper side of the outside is overlaid with strips of straw and brown bark in geometric patterns. The child is laid at length in this apparatus. There is a short loop at one end for suspension vertically. For the purpose of carriage a string is tied to both margins in front, another is similarly tied across the foot of the frame. The carrying string or band is fastened to the middle of these two cross strings and the child is borne horizontally, precisely as in Russia and Siberia. This is a very beautiful object, and though collected among the Kawitchin, is in a style of weaving peculiarly Shahaptian.

The Walla Walla Indian women formerly sat astride a saddle made with high pommel and cantle. In traveling they carried their infants either dangling by the cradle strap to the pommel or slung in a blanket over their shoulders. Here, as elsewhere, a hoop was bent over the child's face to protect it from injury. In these cradles the feet of the children were bandaged and made straight for the coming swift and enduring runner.

Example No. 23845 is a cradle of the Nez Percé, in Wyoming, and example No. 129675 a specimen from the Spokane Indians, both of the Shahaptian stock (figs. 207, 208). Although both tribes are in the Pacific drainage, they are away from the land of boats and in the area of great game. At present they are horse Indians, and they have been so during a long time. Their method of transporting children will, therefore, partake of two natures or spring from two motives.

The passenger is in fact encapsulated in a narrow leather inclosure, very much like the upper part of a passenger toboggan in the Hudson

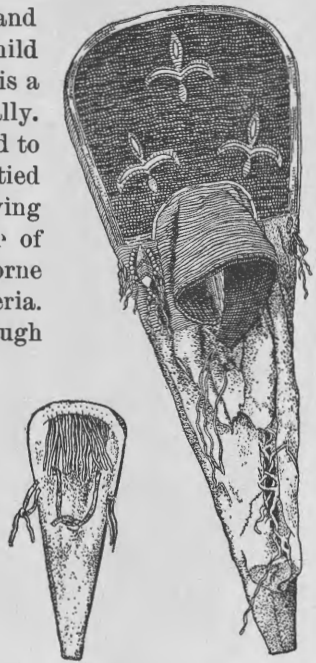


Fig. 208.

SPOKANE (SHAHAPTIAN) CRADLE.
State of Washington.

Cat No. 129675, U. S. N. M. Collected by Mrs. A. C. McBean.

Bay country. The basis of the cradle is a kite-shaped board 3 feet high. The exposed parts of the board, back and front, are covered with buckskin, and above the hood the front is adorned with bead-work. The opening for the child is left by the edges of the buckskin. A rigid lining to the hood forms the protection of the child's head. A strap on the back of the board serves for suspension on the mother's head, from the saddlebow, or upon a limb or hook.

In the making of a cradle by the Chinook Indians at the Columbia mouth, a block of cedar wood 30 inches long and 12 inches square was roughly hewn in shape of a scow with bulging sides. At the foot, on the outside, was carved a handle. The bed was of shredded cedar bark, and the covering, a quilt of the same material roughly held together by twined weaving. A long pad was hinged to the headboard and so arranged as to be drawn down over the child's forehead and lashed to either side of the trough.

An interesting feature about this form of cradle is the appliance for lashing the child, as seen in example No. 2574, U. S. National Museum, fig. 206 (b):

1. A series of holes along the side just below the margin, parallel with the border most of the way, but sloping quite away from it at the head.

2. A cord of coarse root laid along next to these holes on the outside of the cradles.

3. On either side of the bedding a series of loops for the lacing string formed by passing a twine through the first hole, around the root cord on the outside, back through the same hole up to the middle of the cradle to form a

loop, back through the next hole in the same manner.

4. The lacing string runs through these loops alternately from bottom to top.

The ornamentation of this type of cradle is chiefly by means of parti-colored basketry and furs. The Chinook were an advanced people in art, and many of their cradles were very prettily adorned. Mr. Catlin figures one in which the process of head flattening is going forward.¹

Example No. 2575 (fig. 209) is a specimen collected by Wilkes. This cradle board is shaped like a trowel, with a short triangular handle. It



Fig. 209.

CRADLE USED BY THE OREGON INDIANS.

Cat. No. 2575, U. S. N. M. Collected by the Wilkes Exploring Expedition.

¹ Catlin "North American Indians," II, p. 110, pl. 210, letter a.

is covered with buckskin in a single piece, secured around the bottom and up the axis of the cradle as far as the foot of the bed. The bed is a little mound in the middle of the board. Around its lower margin the buckskin covering of the cradle board is stretched by means of a rawhide string run quite through the board and outlining the bed on the back of the board. The flaps of buckskin are drawn up for the bed inclosure, and a series of the ordinary loops are tied along both edges to receive the lashing string. A triangular flap lashed at the three angles covers the legs and feet. A more ornamental flap forms the hood, notched and beaded, and is bound fast over the forehead. Along the top of the cradle are beautiful fringes of leather and bead-work.

The Modoc women make a very pretty baby basket of fine willow work, cylinder shaped, with one-half of it cut away, except a few inches at the ends. It is intended to be set up against the wall or carried on the back, hence the infant is lashed perpendicular in it, with its feet standing out free at one end and the other end covering its head like a small parasol. In one this canopy is supported by small standards spirally wrapped with strips of gay-colored calico, with looped and scalloped hangings between. The little fellow is wrapped all around like a mummy, with nothing visible but his head, and sometimes even that is bandaged



Fig. 210.

HUPA INDIAN CRADLE BASKET.

Cat. No. 126519, U. S. N. M. Collected by Capt. P. H. Ray, U. S. A.

back tight so that he may sleep standing. From the manner in which the tender skull is thus bandaged back it occasionally results that it grows backward and upward at an angle of about 45°.

The painstaking which the Modoc squaw expends on her baby basket is an index to her maternal love. On the other hand, a California squaw often carelessly sets her baby in a deep conical basket, the same in which she carries her household effects, leaving him loose and liable to fall out. If she makes a baby basket it is totally devoid of ornament, and one tribe, the Miwok, contemptuously call it the "dog's nest." It is among Indians like these that we hear of infanticides.

Example No. 126519 (fig. 210) is a cradle basket of the Hupas of northwestern California. A slipper-shaped, openwork basket of osier warp

and twined weaving constitutes the body of the cradle. It is woven as follows: Commencing at the upper end, the small ends of the twigs are held in place one-eighth inch apart by three rows of twined weaving followed by a row in which an extra strengthening twig is whipped or served in place as in the Makah basketry. At intervals of $2\frac{1}{2}$ to 3 inches are three rows of twined basketry, every alternate series having one of the strengthening twigs, increasing in thickness downward. The twigs constituting the true bottom of the so-called slipper continue to the end of the square toe and are fastened off, while those that form the sides are ingeniously bent to form the vamp of the slipper. This part of the frame is held together by rows of twined weaving boustrophedon.



Fig. 211.

YOKALA CRADLE, FROM CALIFORNIA.

From a painting by Mrs. J. W. Hudson.

When two rows of this kind of twining lie quite close, it has the appearance of four-ply plaiting, and has been taken for such by the superficial observer. The binding around the opening of the cradle is formed of a bundle of twigs seized with a strip or tough root. The awning is made of open wicker and twined basketry bound with colored grass. This pretty flat cone, resembles the salmon baskets figured and described in the Ray collection.

The child is not straightened out in this type, but sits with its feet partially exposed. The long toe of the frame holds the infant above the ground. At this point the horizontal and suspensory cradle leaves off and the standing cradle begins.

There is, in the U. S. National Museum, a cradle (example No. 19614) for a new-born babe from the McCloud River Indians, of California, belonging to the basket-tray type. It is shaped very much like a large grain scoop, or the lower half of a moccasin, and made of twigs in twined weaving. There are double rows of twining 2 inches, or such a matter, apart, and nearly all of them are boustrophedon, which gives the appearance of a four-ply braid.

The general shoe shape of the cradle is effected by commencing at the heel, which is here the bottom, and doubling the twigs by a continually sharper turn until, along the bottom, the rods simply lie parallel; that is, the rods that lie along the middle of the bottom terminate at the heel, while those from the sides and upper end are continuous. Around the border and forming a brace across the upper end is a border made of a bundle of rods seizing with tough bast or split root. The twigs themselves project upward, an inch or two from this brace, and are not fastened off.

Dr. J. W. Hudson says that the California coast Indians above San Francisco Bay do not suspend the cradle nor completely swaddle the infant, but they defend the base in order to stand the apparatus on its lower end. To this peculiar arrangement of the child in its bed, Dr. Hudson thinks, is due the bodily form of the people. The Sioux, Algonquian, and other interior tribes subject to long journeys, sudden changes of temperature, and rough handling more securely swaddle their children. The cradle board draws the cervical and spinal bones nearer the same line, flattens the dorsal surface (figs. 211, 212), rounds the thoracic muscles, and represses adiposity.

Example No. 21398 in the U. S. National Museum is a cradle from Potter Valley, California, of willow twigs laid closely together and held in place by an ingenious weaving to be explained further on.

The head of the cradle is a hoop of wood, 1 foot in diameter, quite open. It is fastened to the wickerwork by a continuous coil of twine passing around it and between the willow rods consecutively, being caught over the curious braid that holds the twigs together. In the example described the lashing is of cotton string, but in a more primitive form it would be of hemp or grass cord. The ends of the warp twigs are cut off flush with the hoop. The sides and bottom of the



Fig. 212.

YOKAIA WOMAN CARRYING CHILD.

From a photograph in the U. S. National Museum.

cradle are scoop-shaped with high perpendicular sides, the twigs forming it all terminating at the head hoop.

The rods of the cradle frame are held together by a series of braids about 2 inches apart. This braid is so constructed of a single string as to resemble two rows of coiled sewing on the inside and a close double herringbone on the outside, and is made as follows: Commence at one edge of the fabric and carry the twine along three osiers and down through the warp, bring it back two and through to the front, forward three, crossing number one; through and back two, and through to the front, one rod ahead. Repeat this over and over, forward three, back two, forward three, back two, ready to start again.

Long leather loops are attached to the bottom of the cradle where it joins the upright sides, to receive the lacing string which holds the baby in place.

Example No. 21398 is a Pomo cradle, collected by Stephen Powers, and there are similar specimens from the Concow and other tribes on the Pacific drainage between Cape Mendocino and San Francisco. In this peculiar type the climax of the free feet is reached. Dr. Hudson, who has studied carefully the forms and types of basketry in the region, presents a picture of the child fastened in the frame, and Mr. J. N. Purcell furnishes the accompanying description:¹

This is the baby-carrying basket used by most of the tribes of the Pacific Coast from Cape Mendocino to San Francisco Bay. Being used by them for carrying and nursing purposes, it is the child's almost constant home from the age of 2 weeks until it can stand alone; even then, when the mother is traveling, the child is carried in this basket. After having been dressed, the babe is set or laid in the basket, its face to the opening, the buttock resting on the lower part. The feet hang over the outer edge. The child is usually wrapped in a shawl, which comes down over its feet.

It is fastened in by means of a cord or small rope run through the buckskin loops attached to each side of the basket and wrapped snugly around and around the body of the child. Commencing at the breast, this lacing extends to about 6 inches below the feet. Thus the child can not throw its feet about, nor can it fall out, for the six loops which are run through with cord hold it securely in the basket. This apparatus is carried on the mother's back, the buckskin strap securely fastened on the bottom of the basket and passed around the mother's forehead or breast. Thus the cradle rests securely upon the back and shoulders of the mother. The child's face is, of course, out, and its head, neck, and arms free, save the hoop around the top of the basket. This keeps the head from injury. The small ear-like pieces extending above the hoop on each side about 2 inches are for the purpose of fastening a veil or covering over the face of the child. This is only done when the sun is shining very hot. These baskets are usually made of ordinary creek

¹ See also Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1887, p. 182, fig. 14.

willows, except the hoop and sometimes the two outside ribs, which are of redbud or oak. The pieces running semicircular around from one side of the basket to the other, with twine wrapped about them, are of willow. Instead of twine, sinew or wire-grass roots are most often used.

Example No. 19698 (fig. 188) is a cradle from the Tule tribe. The frame consists of three parts—the foundation, which is a forked stick; the cross-bars, lashed beneath; and the slat of twigs, upon which the bed is laid. Some parts of this frame demand description. The fork is a common branched limb, not necessarily symmetrical, with short handle, and prongs nearly 3 feet long, spreading about 16 inches at the distal end or top.

At the back of the fork are lashed 19 rods of wood projecting at their ends an inch or more beyond the fork. The lashing of the rods to the fork is by means of sinew skillfully crossed both in front and rear—that is; the seizing is partly parallel and partly cross-laced to give the strongest joint. These wooden rods seem to follow a rude plan of pairs, but the design is not clear.

The slat-work on the front consists of a separate transverse rod to which about 40 twigs are attached by bending the large end of each one around the rod and then holding the series in place by a row or two of twined weaving with split twig. To fasten this slat-work in place, the rod is put behind the two outer ends of the forked stick and the twigs



Fig. 213.

YOKAIA WOMAN CARRYING CHILD.

From photograph in U. S. National Museum by Mrs. J. W. Hudson.

laid in order on the front of the series of transverse rods so as to fill neatly the space between the forks. These twigs are held in place by lashing them here and there to the transverse rods and to the side prongs. This lashing crosses the twigs diagonally in front and the rods behind vertically.¹

Upon this cradle rack or frame is fastened the true cradle, which in this instance is a strip of coarse mat made of soft flags, 1 foot wide, joined by crossrows of twined weaving 2 inches apart. This mat is bordered by a braid of flags, and the two ends are puckered or drawn

¹ By a misprint in a former paper the name Klamath is associated with this specimen. Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1887, p. 180, fig. 12.

to a point. The cradle belongs to the open, unhooded type and is made by doubling the matting at the head and drawing it together to a point at the foot. The edge nearest to the cradle frame is joined and fastened to the frame, while the outer edge is allowed to flare open. In this little ark of flags or rushes the baby is placed.

Having escaped from the scoop-like half seat, half cradle, before described, the California child is still obliged to be a passenger. It does not ride pickaback, as the Eskimo, nor on the shoulder, as do the Caucasians, nor on the arm, as often seen in Africa; but it straddles

the mother's hips and is held secure by her shawl or girdle (fig. 213), recalling rather the infants of Japan and thereabout.

Example No. 24146 in the U. S. National Museum is from the Mohave, in southern California and Arizona. The frame of this cradle is a prettily made ladder or trellis, built up as follows: A pole of hard wood about 7 feet long is bent in shape of an oxbow, the sides 7 inches apart at top and 5½ inches at bottom, so that the cradle is a little narrower at the foot. Eleven cross bars, like ladder rounds, connect and strengthen the frame, commencing at the bottom and ending near the bow. These rounds consist each of three elements—a rod or spreader between the two sides; a strap-like binding of two or three split twigs clasping the sides and laid along on the spreader; a seizing of tough twig holding fast the straps and

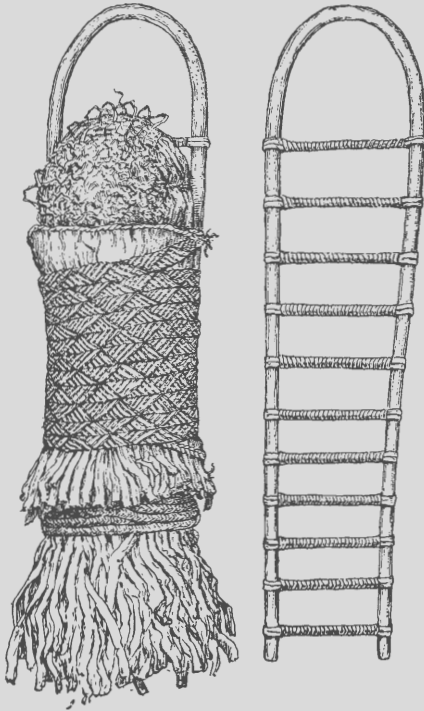


Fig. 214.

MOHAVE TRELLIS CRADLE AND BED.

Cat. No. 24146, U. S. N. M. Collected by Edward Palmer.

spreader. The drawing of the reverse side clearly sets forth the manner of administering this light but strong cross bracing (fig. 214).

Upon this ladder is laid the cradle bed of willow or mezquite bast, made as follows: Three bundles of stripped bast, each about an inch in diameter, are lashed at their middle with the same material. They are then doubled together concentrically and spread out to form a bed. On this is laid a little loose finely-shredded bast, like a nest, and the bed is ready for the baby.

A dainty quilt or counterpane of bast is made from strips 30 inches long, doubled and braided at the top like a cincture. This braiding is

unique and so very neatly done as to demand explanation. Two strips of bast are seized about their middle by a single twist of the two elements of twined weaving. Of course, two halves will project above and two below the twist. Lay two more strips of bast in the second bight of the twist and draw down the first two upper ends, one to the right of the twist and draw down the first two upper ends, one to the right of and the other between the second pair of strips, seizing them in place by another half turn of the twines. Lay on a third pair of bast strips and bring down the second pair of ends projecting upward, as at first. The weaving consists of four movements, namely: Laying in a pair of bast strips, grasping them with a half turn of the two twining wefts, bending down the two upward strips just preceding, one between, the other outside of the last two strips, and grasping them with a half turn of twine.

The lashing belts of this cradle are 12 to 15 ply braids made up of red, green, white, and black woolen and cotton cords, plaited after the manner of the straws in hat making. Special attention is called to the peculiar type of ornamentation undesignedly originated by braiding with threads of different colors. On this belt of several colors the threads are so arranged as to produce a continuous series of similar triangles, filling the space between two parallel lines by having their bases above and below alternately. Not the worst of the ornamentation is the parallelism of the braiding threads, now to one side of the triangle and in the next figure running in a direction exactly at right angles. One of the commonest ornaments on pottery, rude stone, and carved wood is this distribution of lines in triangles.

The floor of the Yaqui cradle (fig. 215) is of the slatted type, 30 inches long. A dozen or more reeds, such as arrow shafts, are fastened in the same plane by dowel pins. The reeds are not bored for the pins but simply notched in a primitive fashion. There is no cradle trough, but a bed of bast, shredded, is laid on longitudinally. The pillow consists of a bundle of little splints laid on transversely, at either end of which is a pad of rags. There is no awning, and the lashing material in this instance is a long cotton rag, taking the place of a leather strap, passing round and round baby and frame and fastened off in a martingale arrangement crossing the feet and tied to the lower corners of the cradle.

When a Pima child is able to stand alone, the mother allows it to

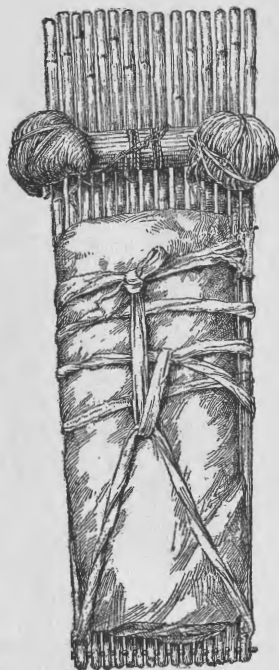


Fig. 215.

CRADLE FRAME OF REEDS, USED BY
THE YAQUI INDIANS OF SONORA.

Cat. No. 9396, U. S. N. M. Collected by Ed-
ward Palmer.

mount upon the immense cinctures of bark worn on her back and to grasp her around the neck. On long journeys, says Edward Palmer, they use the cradle board.

Leaving the Pacific Slope and reverting to the Great Interior Basin, the Shoshonean tribes in the far north will be found adapting themselves to the surrounding Siouan, Salishan, and Shahaptian customs. They are on the drainage of the great Columbia and in the area of buckskin. For the most part, the basis of all Shoshonean cradles is of twig, a kind of open basketry with a warp of rods and a row of twined weaving here and there. Upon this grating the awning is built up for

the face. Over it the covering of buckskin is stretched and to it the headband is attached as it is to the universal conical packing basket of the same culture area.

Example No. 128342 in the U. S. National Museum (fig. 216) is a cradle of the Uncompahgre Utes collected, with others, by Captain Beckwith, U. S. A. It is built upon a kite-shaped board. Special attention is called to the two suspension straps, one near the top for hanging in the cabin, the other lower down for the woman's forehead, to set the load well up on the back.

Maj. J. W. Powell collected a variety of Ute cradle frames in his early explorations. Example No. 14646, from the Colorado Utes, is shown in three views.

The frame is based on a dozen or more twigs, without bark, laid parallel. Underneath these is laid an ellipsoidal hoop, spread a little way beyond the rod at the sides. A stick is laid across under the rods and is fastened at its ends to the hoop and also to the rods by the wrapping of a filament. Two or three rows of twined weaving hold the rods in place at intervals. Over the frame a dainty awning is built and a covering of beautiful white buckskin incloses all. The carrying band is attached to the crossbar and goes over the forehead of the mother.

Example No. 14646 (fig. 217) is a cradle of the Utes of southern Utah. This cradle has the oxbow frame lathed along the back with twigs close together and held in place by a continuous seizing of sinew. It is a rude affair, but this is evidently due to the lack of material in a desert country rather than to want of taste in the maker. The awning for the

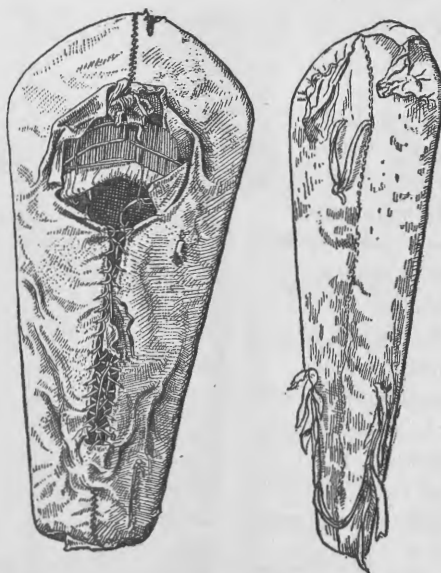


Fig. 216.

UTE CRADLE.

The frame is made of sticks covered with buckskin.

Cat. No. 128342, U. S. N. M. Collected by Captain Beckwith, U. S. A.

face is a band of basketry, 4 inches wide, attached by its ends to the side frame of the cradle. This band is of twined weaving, the weft running boustrophedon. Notice especially that each half turn of the twine includes two warp twigs and that when the weaver turned backward she did not inclose the same pairs of warp twigs, but twined them in quincuncially, creating a mass of elongated rhomboidal openings, exactly as the Aleutian Islanders weave their marvelously fine grass wallets, while the Ute weaving is a model of coarseness in an identical technique with unaccommodating material. The headband of buckskin

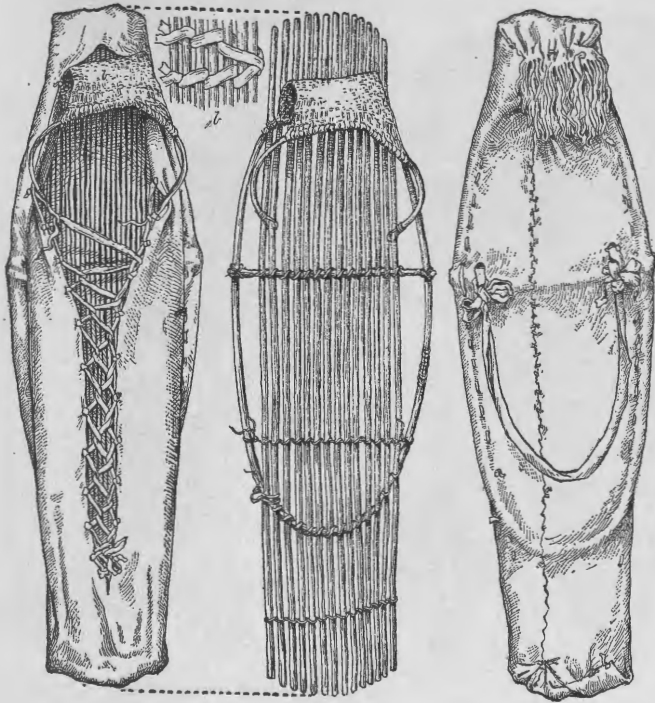


Fig. 217.

UTE CRADLE.

The frame is of rods covered with buckskin.

Cat. No. 14646, U. S. N. M. Collected by Maj. J. W. Powell.

is not tied immediately to the bowed frame, but is knotted to a loop made of a narrow string wound three times around the frame and knotted.

Pyramid Lake, Nevada, is on the border of California and adjoining to the Palaihnihan or Achomawi and Pujunan families of the last named States. Examples Nos. 19040 and 76734 (fig. 218) are from the Nevada Utes.

When the Ute babe leaves its swaddling frame, and before it comes

to be entirely independent, it passes an intermediate stage, like the opossum, in an open sack. In this case the mother puts her shawl or robe about her, straps her bandolier around over one arm and under the other, and the young passenger has an apartment below which it can not go. Example No. 152252 (fig. 219) shows the Ute mother carrying a 2-year-old child.

The cradles of the cliff dwellers were made in the shape of an ellipse, constricted slightly at the sides. Small reeds or twigs were laid side by side lengthwise and on top of these crosswise, as in African shields

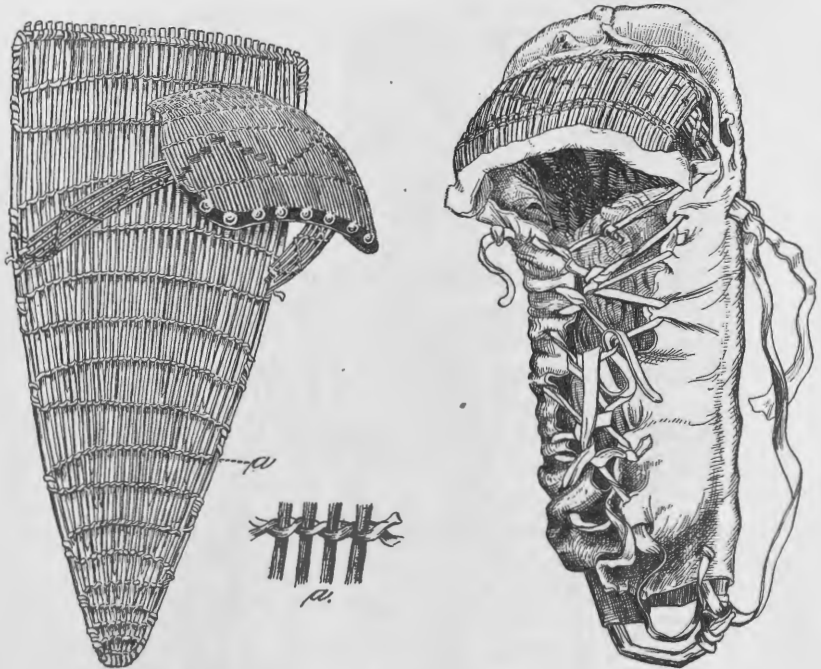


Fig. 218.

CRADLES OF NEVADA UTES, SHOWING CALIFORNIAN INFLUENCE.

Cat. Nos. 19040 and 76734, U. S. N. M. Nevada exhibit, New Orleans Exposition.

On one side the sticks run up and down; on the other side they run crosswise. The two sets are held together by weaving in geometric patterns. On some of these cradles the hood is still preserved.

Example No. 21523 in the U. S. National Museum (fig. 220) is a very elaborate Apache cradle, the substantial part consisting of the frame and the hood. The frame is elliptical in outline, being formed by a pole of wood bent and the two ends spliced and lashed. Upon this ellipse are laid laths of pine, planed. Over the child's face is built the hood formed by bending two bows of supple wood to the required shape and overlaying them with transverse laths of pine laid close

together and tied down. The upper edges of these laths are beveled, so as to give a pretty effect to the curved surface. The leather work on the cradle consists of a crown of white buckskin to the hood, a binding of brown buckskin to the bowed frame above the hood variegated with narrow bands of white buckskin, and finally, the true sides or capsule of the cradle, consisting of a strip of soft, brown buckskin, say 10 inches wide, cut in a fringe along its lower border and edged with fringe of white buckskin along its upper outer edge. This strip



Fig. 219.

UTE SQUAW CARRYING CHILD.

From a photograph in the U. S. National Museum.

is fastened to the cradle continuously, commencing at an upper margin of the awning, carried along this awning, fastened to its lower margin 4 inches above the junction of awning and frame, passing on to the foot and around to the other side as at first. Slits are made in the upper edge of the brown buckskin just below where the white buckskin fringe is sewed or run on, and back and forward through these slits a broad, soft band of buckskin passes to form the cradle lashing. To perfect the ornamentation of this beautiful object, tassels of buckskin

in two colors and strings of red, white, and blue beads are disposed with great taste.

A simpler form of cradle, based, however, upon the elongated hoop, is shown in fig. 221, introduced here to illustrate all the details involved, to wit, the method of wearing the headband, the function of the awning as a cover and a place for toys, the border loops as on the margin of a sandal, the cross lacing, the free feet in accordance with the widespread west coast and northern habit, the modern style of wearing the blanket,

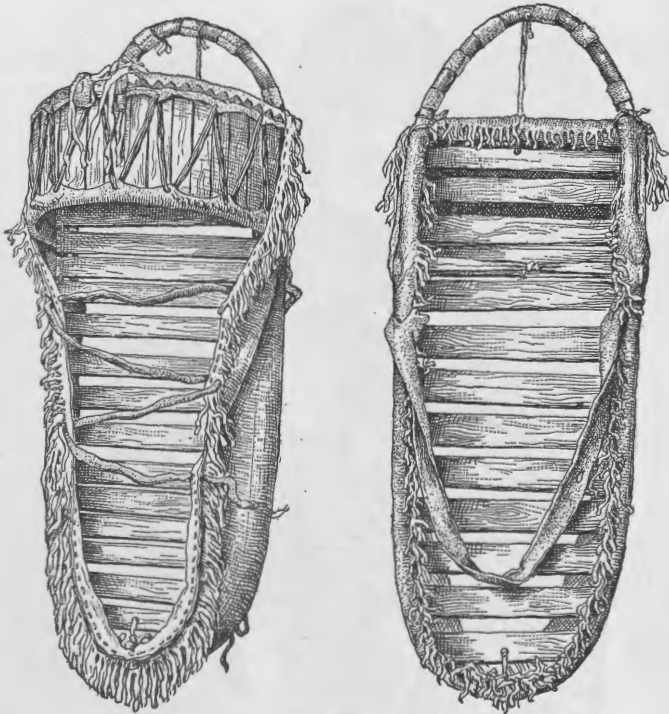


Fig. 220.

APACHE SLAT CRADLE, WITH HOOD.

Cat. No. 31523, U. S. N. M. Collected by Dr. J. B. White, U. S. A.

the moccasins of the mother soled and having a protection against thorns in front, and, finally, her leggings, each one made of an entire deerskin.

The Navajo cradle, No. 127615, and the one with which it is compared (figs. 222 and 223), are built upon two strips of thin board, each pointed at the top, after the manner of the Indians on the plains. The awning of splint bows in figure 222 is suggestive of the buggy-top awning affected by the Zuñi Indians. This and many other introduced elements make it very difficult to discriminate what is truly aboriginal from what is not.

The packing, the lacing, the bedding, the pillow, and the headband are characteristic of the region. The cover or spread of buckskin and the foot rest are not so common. The former is of the north or of elevated and cool regions; the latter has a distribution not worked out. It will be seen on Iroquoian and other eastern forms, and on a Pitt River cradle from California, example No. 21411, figured upside down in the U. S. National Museum Report of 1887, page 180. This cradle of the Navajo Indians resembles the same article made by the Rocky Mountain tribes. It includes the flat board to support the vertebral column of the infant, with a layer of blankets and soft wadding to give ease to the position, having the edges of the framework ornamented with leather fringe. Around and over the head of the child, who is strapped to this plane, is an ornamented hoop, to protect the face and cranium from accident. A leather strap is attached to the vertebral framework to enable the mother to sling it on her back.¹

The Zuni use a simple cradle board with parallel sides and the top either cut semicircular or notched in gradines in imitation of a kind of ornament much affected by these people in their decoration. Holes are bored along the sides for lashings and carrying strap. A block pillow, identical in form with the pillow blocks of many European peoples, performs the functions of a head rest and of a cleat. There are many examples in the U. S. National Museum, of which Nos. 41184 and 69015 are types.

The elements of the Moki cradle frame, example No. 23154 in the U. S. National Museum (fig. 224), are the floor and the awning. The floor is of the oxbow type, having the bow at the foot and the loose ends projecting upward as in the Yokaia and other California frames. The Moki are the only savages west of the Rocky Mountains known to the writer who make real wicker basketry. This cradle frame is covered with wicker of unbarked twigs, four rows on the floor and four on the awning. The warp of the floor is formed of series having two twigs each. There is a great variety in the delicacy, the number of warp strands, and the minor details in the Moki cradle floors. Indeed, while they are all alike in general marks, there are no two alike in respect to patterns. The awning is still more varied. Fundamentally it is a band of wicker basketry longer than the cradle is wide, its ends securely fastened to the frame sides by lashings of yucca

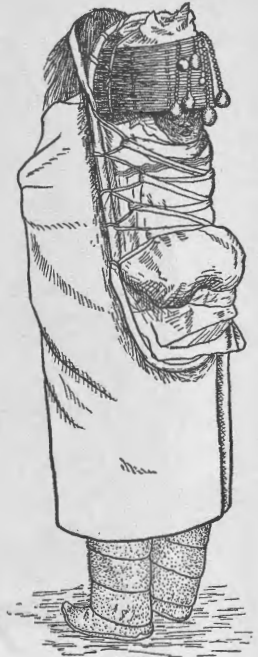


Fig. 221.

APACHE SQUAW CARRYING CHILD.
From a photograph in the U. S. National
Museum, by A. Frank Randall.

¹ Schoolcraft's Archives, IV, pp. 435-436; also Bancroft's Native Races, I, p. 501.

fiber or string. Here and there stitches are omitted so as to effect an openwork ornamentation. An additional strip frequently passes at right from the apex of the awning at the upper edge to the floor of the frame at its upper end. (Fig. 225.)

The Quiché mother in Guatemala carries her babe on her back while she is at work and rocks it in a hammock while it is asleep.

The Muso and Colima, on the Magdalena, in Colombia, formerly laid their children in cradles made of reeds, just big enough to contain that

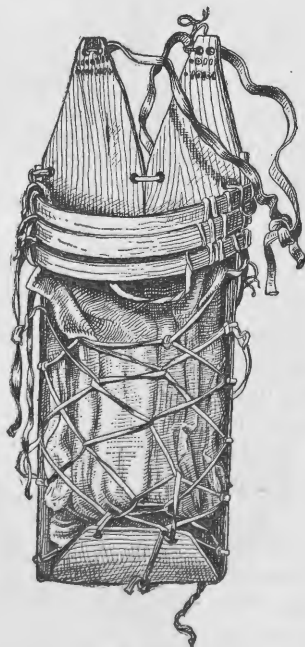


Fig. 222.

NAVAJO CRADLE BOARD.

From a figure in the Report of the Smithsonian Institution (U. S. National Museum), 1887.

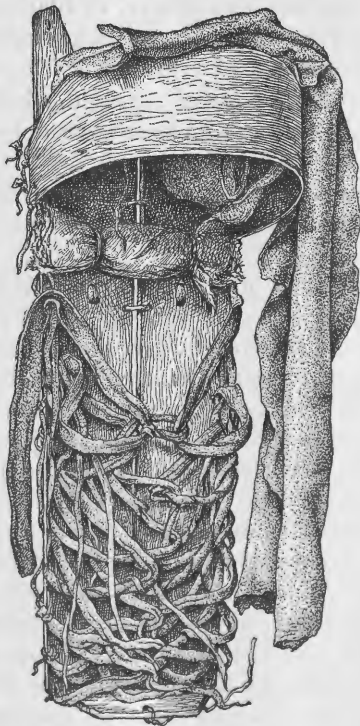


Fig. 223.

COMPLETE NAVAJO CRADLE, WITH HOOD AND BUCKSKIN AWNING.

Cat. No. 127615, U. S. N. M. Collected by Dr. R. W. Shufeldt, U. S. A.

little body, binding their wrists and the brawny parts of the arms, as also their legs at the ankles and the calves, placing them with the head downward, and the feet up, the cradle resting against a wall stooping, that their heads might grow hard and round.¹ Leaving out the last interpretation, it is certain that the Muso infant was laid in a little trough of reeds, which should be compared with those cradles made of a bit of skin rolled up and with the cylindroid cradles of wood in

¹ Antonio de Herrera, "History of America," vi, p. 183.

Siberia. The binding of the whole body, feet and all, in this region is interesting.

The Peruvians of old, it is said, used cradles of textile, not unlike those of California, but the Patagonians seem to be the only South Americans that actually strap their babies to a frame. On the pottery of Peru, children are seen lying in the lap, riding astride the neck, and sitting on the shoulder, but not fastened in cradles.

Wiener figures a barefooted woman at Andaymayo, Peru, with her child in a sash which passes around her waist and over the right shoulder. Both hands are active in carrying objects.¹

This fact should be considered in connection with the custom in the Tropics of wearing the infant about the naked body by the mother. On reaching elevated ground the cradle frame does not immediately appear, but the shawl or other garment becomes more and more the nesting place of the tiny passenger. Custom and climate play upon each other at every turn, and the typical plan is apparent at each.² But cradles did exist, made of reeds as shown, along the Cordilleras.

The Aymara Indian women of Tarapaca wear a long cotton garment, over which is a woolen dress, then a long mantle fastened by tupus or pins of silver, a long waistband, then the female poncho in which they carry their children behind them.³

The Araucanian infant is rolled up in bandages and put into a cradle frame which may be carried about by the mother or hung to a peg driven into the walls of the house or laid in baskets suspended from the roof so that they can be swung by a cord tied to the cradle.⁴

The Araucanian woman is often figured in the rôle of both passenger carrier and burden carrier (fig. 226). The child is laced on a rack and borne on the back by means of a headband. At the same time any amount of provisions may be stored in a netted bag suspended from the

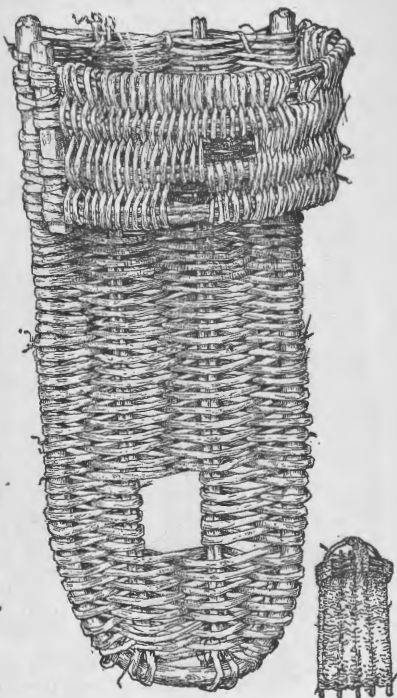


Fig. 224.

MOKI WICKER CRADLE WITH AWNING.

Tusayan, Arizona.

Cat. No. 23154, U. S. N. M. Collected by Maj. J. W. Powell.

In the smaller figure the awning is over the bowed end.

¹ Pérou et Bolivie, p. 180.

² Excellent figure in Wiener's "Pérou et Bolivie," p. 395. The infant is snugly wrapped in a shawl tied across the mother's clavicles.

³ W. Bollaert, "Ethnology of South America," p. 250.

⁴ Wood, "Uncivilized Races," Hartford, II, p. 546.

shoulder by a bandolier. She carries her baby in a sitting posture; so do the Californian women, as opposed to the others whose children are prone in the frame. The Araucanian frame resembles in make-up that used by the Aino porter. It is worthy of inquiry whether the introduction of the horse into this region occasioned the rigid frame.

According to J. G. Wood, quoting Captain Bourne, the children of the Patagonians are laid in a square piece of guanaco skin, hung hammockwise by four ends to the rafters of the hut. During the daytime infants are packed in cradles made of pieces of board, between two pieces of guanaco skin. When the family is shifting quarters, the cradle is hung on the saddlebow of the mother's horse.

Bourne says that the papooses of the Indians of Patagonia, in traveling, are lashed to a kind of wooden sledge, rounded at the ends like sleigh runners, and crossed with narrow slats that bind the parts strongly together. The little ones are bound upon these machines, which are so shaped that their heads and feet are much below the general level of their bodies—a very uncomfortable position for the youngsters, if they have as much sensibility to pain as other children, of which there is much doubt, as they are inured from birth to almost every species of hardship. The sledge, with its living burden, is thrown across the horse's back, and made fast to the load.¹

In Paraguay the cradle frame reappears after having passed out of sight throughout the entire tropical area. A hammock for little children is made of a hoop inclosing a net and

supported by three short lines united as in a pair of scales and attached to a long line suspended from the roof.

The Indians of the Gran Chaco are expert swimmers. Of their movements across a stream, Wood says that they, with one hand, guide the horse, or hold to the spear with its light burden, and with the other paddle themselves across. The children and goods are conveyed in square boats or pelotas made of hide and towed by a rope tied to the tail of a horse or held in the mouth of a good swimmer.²

In comparison with the carrying frame of Guatemala should be

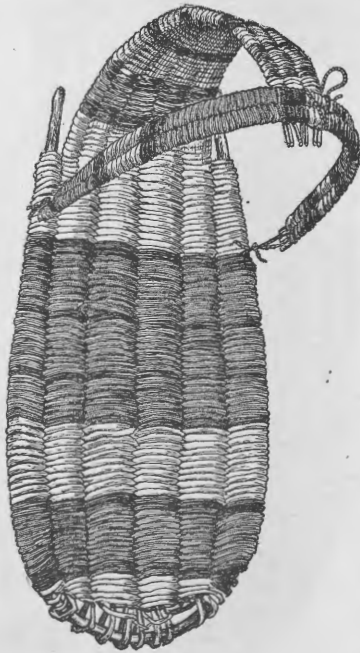


Fig. 225.

MOKI CRADLE-FRAME FROM TUBAYAN, ARIZONA.
Cat. No. 11789, U. S. N. M. Collected by Maj. J. W. Powell.

¹ Bourne, "Captive in Patagonia," Boston, 1853, p. 82; illustrated.

² Wood, "Uncivilized Races," Hartford, II, p. 572.

studied a frame from Guiana, called a cradle by J. G. Wood. It is in form of a scoop inverted, made of the split reed so common in the Carib art. The part nearest the carrier's back is widest, and the frame sticks project conveniently for the headband.¹

Ratzel figures a boat-shaped cradle used by Brazilian Indians, with



Fig. 226.

ARAUCANIAN WOMAN CARRYING CHILD AND PROVISIONS.

From Simon de Schryver's "Royaume d'Araucanie-Patagonie."

apparatus for flattening the head, but there is not the slightest intimation of carrying it.²

In all pictures and descriptions of carrying children in Central Brazil no cradle is seen whatever. The naked child rides on the mother's hip or shoulder and may be clasped in the arms. Or again it will be seen astride her neck, precisely as appears in the pictures of the Eskimo.³

¹ Wood, "Uncivilized Races," Hartford, II, p. 609, with figure.

² "Völkerkunde," II, p. 622.

³ von den Steinen, "Unter den Naturvölkern Zentral-Brasiliens," pl. IX, p. 112; also Fletcher and Kidder, "Brazil and the Brazilians," Philadelphia, 1857, p. 472.

CRADLES AND CRADLE-FRAMES IN THE U. S. NATIONAL MUSEUM.

Museum No.	Specimen.	Locality.	By whom contributed.
167899	Cradle with rockers.....	Finland.....	Hon. Jno. M. Crawford.
150768	Carrier, baby.....	Japan.....	Romyn Hitchcock.
32986	Cradle, toy.....	Norton Sound, Alaska..	E. W. Nelson.
8894	.....do.....	St. Lawrence River.....	Dr. F. B. Hough.
18806	Frame, carved and painted.....	St. Regis, N. Y.....	Do.
18828	Frame, carved and painted.....	do.....	Do.
18829	Frame, carved and painted, beaded.....	do.....	Do.
73311	Cradle, model, probably Sioux.....	Dakota.....	Catlin collection.
73312-73313	Cradle, probably Sioux.....	do.....	Do.
169069	Cradle, Kiowa Indians.....	Indian Territory.....	Jas. Mooney.
58607	Cradle, bead work, South Cheyenne.....	do.....	Col. R. J. Dodge, U. S. A.
152804	Cradle, Cheyenne Indians.....	do.....	Jas. Mooney.
165836	Cradle, beaded, Cheyenne Indians.....	do.....	Voth collection.
153596	Cradle, Arapahoe Indians.....	Oklahoma.....	Capt. R. H. Pratt, U. S. A.
165774	Cradle, porcupine-quilled, Arapahoe.....	do.....	Voth collection.
152944	Cradle, Wichita Indians.....	Indian Territory.....	Jas. Mooney.
6918	Cradle, Comanche Indians.....	do.....	Edward Palmer.
6970	Skin bed, child's, Comanche.....	do.....	Do.
73333	Frame for cradle, Haida Indians.....	Queen Charlotte Island..	Catlin collection.
9027	Cradle model, Nez Perce Indians.....	Idaho.....	Dr. E. Storrer, U. S. A.
129675	Cradle, Spokane Indians.....	Washington.....	Mrs. A. C. McBean.
1043-1044	Cradles, Makah Indians.....	do.....	J. G. Swan.
5366	Cradle, model.....	do.....	George Gibbs.
153548	Cradle, Chinook Indians.....	do.....	Dr. Franz Boas.
1757	Cradle board.....	Columbia River.....	Maj. Osborn Cross, U. S. A.
2574-2575	Cradle, models.....	Oregon.....	Lieut. Wilkes, U. S. N.
127616	Cradle, model, twined basketry.....	do.....	Mrs. J. O. Dorsey.
21337	Papoose basket, with shade, Hupa Indians.....	Trinity River, California.	Stephen Powers.
21411	.....do.....	Pitt River, California.....	Do.
165679-165680	Papoose basket, Pomo Indians.....	California.....	Bureau of Ethnology.
167321	Cradle, model.....	do.....	L. L. Frost.
181109	.....do.....	do.....	N. J. Purcell.
19617	Basket, papoose, model.....	Colorado.....	Stephen Powers.
150401	Cradle, Sac and Fox Indians.....	Ind. Territory.....	Frederick Starr.
168398	Cradle, baby dressed, Kiowa Indians.....	Haworth collection.....	World's Columbian Exposition.
168416	Cradle, doll's, beaded.....	do.....	Do.
164811	Cradle, Sioux.....	Pine Ridge Agency.....	Miss E. C. Sickels.
154361	Cradle, beaded, Crow Indians.....	Montana.....	Dr. W. J. Hoffman.
152945-152948	Cradle, Kiowa Indians.....	Indian Territory.....	Jas. Mooney.
152947-152949	.....do.....	do.....	Do.
21398	Cradle, papoose.....	Potter Valley, California..	Stephen Powers.
19697	Shade for cradle.....	Tule River, California..	Do.
19698	Basket, papoose.....	do.....	Do.
22290	Board, papoose, Bannock and Shoshone Indians.....	Fort Hall Agency, Idaho..	Wm. H. Danilson.
151898	Cradle, doll's, Bannock.....	Idaho.....	Capt. Jno. G. Bourke, U. S. A.
19040	Cradle, papoose.....	Nevada.....	Stephen Powers.
10741	Bed, papoose, Ute Indians.....	Colorado.....	Maj. J. W. Powell.
10796	Cradle, Ute Indians.....	do.....	Do.
10797	Frame, papoose, Ute Indians.....	do.....	Do.

CRADLES AND CRADLE-FRAMES IN THE U. S. NATIONAL MUSEUM—Continued.

Museum No.	Specimen.	Locality.	By whom contributed.
19614	Basket, papoose, McCloud River Indians.	Colorado.....	Livingston Stone.
11222-11223	Cradle, papoose, Moki Indians.....	N. E. Arizona.....	Maj. J. W. Powell.
11909-11912	Cradle, Pai Utes.....	Southern Utah.....	Do.
14643-14646	.....do.....	.....do.....	Do.
14647	Cradle, toy, Pai Utes.....	.....do.....	Do.
76732-76734	Cradles (3), Pai Utes.....	Nevada.....	New Orleans Exposition, from Nevada State Ex- hibit.
128342	Cradle, Uncompahgré, Ute.....	.....do.....	Capt. Beckwith.
152564	Board, papoose, model.....	Utah.....	Lewis Engel.
11789	Cradle and doll, Moki Indians.....	Oraibi, Arizona.....	Maj. J. W. Powell.
166788	Cradle, Hupa Indians.....	Northern California.....	Do.
166813	Cradle, toy, Hupa Indians.....	.....do.....	Do.
166884	.....do.....	Arizona.....	Do.
40073	Cradle, papoose, Zuni.....	.....do.....	F. H. Cushing.
41184-41187	Cradle, toy and doll, Zuni.....	.....do.....	Col. Jas. Stevenson.
152489	Cradle, Mohave Indians.....	.....do.....	Geo. A. Allen.
27834	Cradle, with frame, Pima Indians.....	.....do.....	Mrs. G. Stout.
174438	Cradle, Papago Indians.....	.....do.....	W J McGee.
23134	Cradle, toy, Moki Indians.....	Northeastern Arizona.....	Maj. J. W. Powell.
23148	.....do.....	.....do.....	Do.
41725	Cradle, toy, Zuni Indians.....	.....do.....	Col. Jas. Stevenson.
41985-41986	Cradle, basket-work, with top, Moki Indians.	New Mexico.....	Do.
41987	Cradle, basket-work, without top.....	.....do.....	Do.
41988	Cradle, Moki Indians.....	.....do.....	Do.
70957-70958	Cradle, toy, Moki Indians.....	Arizona.....	Do.
70959-70961	Head guard for cradle, Moki In- dians.	.....do.....	Do.
84111	Cradle, toy, Moki Indians.....	New Mexico.....	V. Mindeloff.
166686	.....do.....	.....do.....	Jas. Mooney.
69301	Cradle, doll's, Zuni Indians.....	.....do.....	Col. Jas. Stevenson.
18766	Cradle, portion of.....	Santa Cruz.....	P. Schumacher.
5566	Cradle, Apache Indians.....	Arizona.....	Edward Palmer.
21523-21524	Frame, for papoose, Apache In- dians.	.....do.....	Dr. J. B. White.
151909	Cradle, doll, Apache Indians.....	.....do.....	Capt. Jno. G. Bourke, U. S. A.
9545	Cradle, Navajo Indians.....	New Mexico.....	Edward Palmer.
10339	Basket, for papoose, Mohave In- dians.	California.....	Do.
24146	Cradle, Mohave Indians.....	.....do.....	Do.
22545	Cradle, toy, Moki Indians.....	Northeastern Arizona.....	Maj. J. W. Powell.
9396	Cradle, Yaqui Indians.....	Sonora, Mexico.....	Edward Palmer.
127615	Cradle, Navajo Indians.....	Fort Wingate, N. Mex..	Dr. R. W. Shufeldt, U. S. A.
130650	Cradle, Yaqui Indians.....	Sonora, Mexico.....	Edward Palmer.

THE CARRYING OF ADULTS.

It was seen in the foregoing discussion that there are two periods in the carrying of children associated with two distinct types of activities:

1. The period of helpless infancy, calling for bed, swinging or rocking-cradle, and carriage. The inventions associated with this period have passed through a wonderful evolution and elaboration, whose climax is all modern beds, cradles, baby jumpers, walking devices, carriages, and the great array of pediatric apparatus for the deformed.

2. The second period of infancy is devoted to learning the act of walking. About the home the child escapes from its cradle and soon finds itself going about. The mother, however, can not always wait for its slow locomotion and proceeds to carry it in an extremely primitive fashion, and allows it to mount her neck or back or hip without the aid of intervening devices.

In the earliest periods of culture or artificiality in living, there were no class conditions which demanded that one should be borne upon the backs of others by reason of rank.

The carrying of adults, or riding on human backs, was not in primitive times a world-wide enjoyment, and was never an industry until the climax of the hand epoch was reached. The dead were borne to

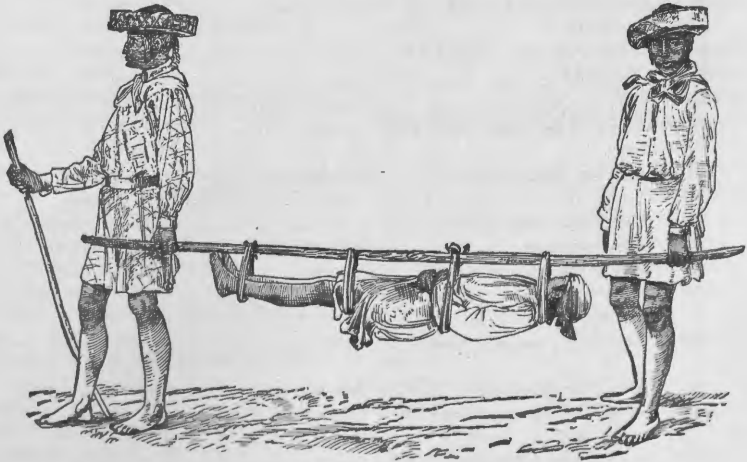


Fig. 227.

BIERE USED BY THE SEMINOLES OF FLORIDA.

From a figure in the Fifth Annual Report of the Bureau of Ethnology.

their burial, helpless persons were assisted from the fight, and those who held some rank were carried on the backs or shoulders of men. But walking was the order of the day prior to the taming of the reindeer, camel, ass, horse, ox, and elephant. The Seminole Indians did not double up the corpse for burial, but laid it out straight. A long pole was placed above the body and securely tied thereto by bands at the neck, the middle, and the feet. Then two or more men lifted the

pole and carried the dead to the last resting place (fig. 227). The single stick, with a passenger lying or sitting in a hammock beneath, is also the simplest form of carriage for the living. The next simplest device for bearing the living has for its manual part two poles instead of one. The Japanese use one pole, the Chinese and Koreans use two. In the Madeira Islands will be seen the single-pole hammock (fig. 228). But the double-pole riding chair was almost universal before good roads and wheel carriages and illuminated cities. It existed in several parts of semicivilized America. The U. S. National Museum possesses an example from Madagascar. The Caucasian subspecies in all its branches were familiar with it, and it was only a century ago, when streets were lighted at night sufficiently for carriages, that sedan chairs of most costly patterns went out of vogue.

The *basterna* was a kind of litter with two poles or shafts, in which women were carried in the time of the Roman emperors. It resembled

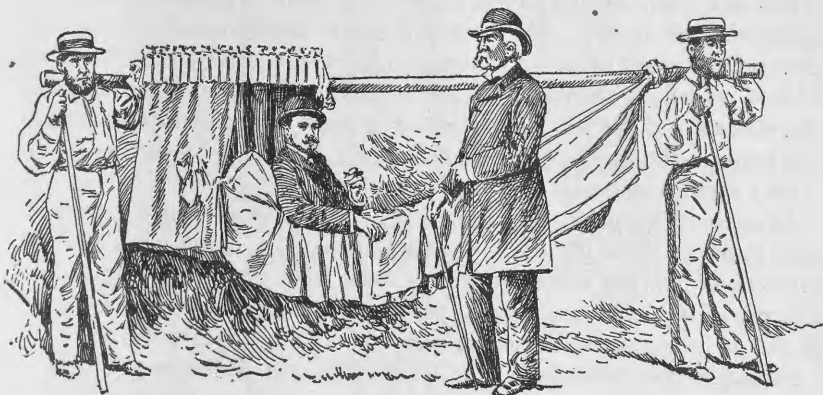


Fig. 228. -

HAMMOCK CARRIAGE, FROM MADEIRA, WITH TWO BEARERS.

From a photograph in the U. S. National Museum.

the *lectica*, or common litter, and the sedan chair, only the latter was carried by slaves while the *basterna* was supported by two mules,¹ the shafts running through stirrups on the saddle of each.

The ordinary bier is carried, not on the shoulders, but about a foot from the ground, by handles, but among the Maronites and other Syrian Christians, according to Tristram, the bier is borne aloft on the upstretched and reversed palms of a crowd of bearers, who rapidly relieve one another in quick succession.² The same method has been mentioned in the carrying of the throne chair of a Persian king aloft on the palms of bearers.³

The body of an Egyptian, when prepared for interment, says Lane,

¹ Smith, Dictionary of Greek and Roman Antiquities, s. v. *Basterna*, with woodcut.

² Tristram, "Eastern Customs in Bible Lands," London, 1894, p. 98.

³ Montfaucon, *L'Antiquité expliquée*, Paris, 1722, II, p. 183.

is placed in the bier, which is usually covered over with a red or other cashmere shawl. Three or four friends of the deceased usually carry it for a short distance; then three or four other friends bear it a little farther, and then these are in like manner relieved.

The biers used for the conveyance of the corpses of females and boys are different from those of men. They are furnished with a cover of wood, over which a shawl is spread, as over the bier of a man, and at the head is an upright piece of wood, called a sháhíd. The sháhíd is covered with a shawl, and to the upper part of it, when the bier is used to convey the body of a female of the middle or higher class, several ornaments of female headdress are attached. On the top, which is flat and circular, is often placed a ckoor's (the round ornament of gold or silver set with diamonds, or of embossed gold, which is worn on the crown of the headdress); to the back is suspended the suf'a (or a number of braids of black silk with gold ornaments along each, which are worn by the ladies, in addition to their plaits of hair, hanging down the back). The bier of a boy is distinguished by a turban, generally formed of a red cashmere shawl wound round the top of the sháhíd, which, in the case of a young boy, is also often decorated with the ckoor's and suf'a. The corpse of a very young child is carried to the tomb in the arms of a man, and merely covered with a shawl, or in a very small bier borne on a man's head.¹

In ancient Egyptian burial and religious scenes nothing is more common than the same piece of furniture. But it is not certain that the function of bearing the dead thus is older than that of bearing the living, especially royal and sacred persons. Assyrian pictures are quite as full of living scenes in which men and women are thus borne.²

Example No. 160156 in the U. S. National Museum (fig. 229) is a Chinese carrying chair containing a great many separate inventions worthy of special notice. It is made of bamboo throughout, and almost without the use of pegs or lashings. For the legs and side bars of the seat two stout bamboos are chamfered out at the points where the tops of the legs should be, these gashes being as far apart as the width of the seat. The legs are bent down at right angles, inclosing in the chamfered part two other bamboos which form the front and the back bar of the seat. A few inches above the floor a bamboo is fitted snugly about the legs by the same chamfering and bending. The arm post and stirrups for the carrying bar on each side are chamfered and bent still more curiously. One piece serves as an additional side bar, as an arm post, and is then chamfered and bent down over the carrying bars. The seat above the lower encircling bamboo is boxed in with bamboo splints. The back is quite equal in motif to the Austrian bent-wood chair; the chamfering and bending, and lashing with split bamboo and inserting, when all other resources

¹ Lane, "Modern Egyptians," London, 1846, i, pp. 288, 297.

² Cf. Erman, "Life in Ancient Egypt," p. 65.

fail, together constitute a combination which is about as far as the inventor could go with his materials and his tools.

The awning frame is of smaller canes bowed at the top and so constructed that the vertical rods will fit snugly on the carrying bars.

The adjustable foot rest is a luxury built on in the same fashion as the other parts are made, getting the best strength and results with the least material. The carrying bars are movable, and when stood up in the corner they leave the passenger in his easy chair.

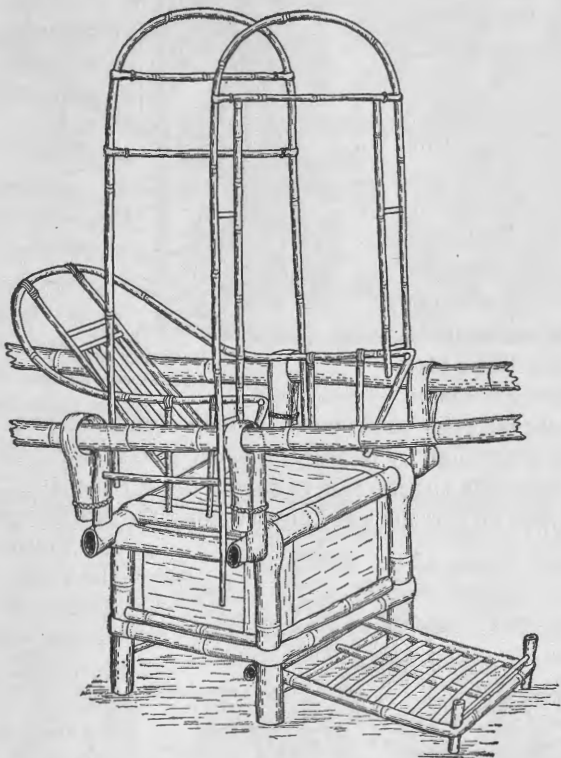


Fig. 229.

CHINESE CARRYING-CHAIR OF BAMBOO.

Cat. No. 160156, U. S. N. M. Gift of the Chinese Centennial Commission, 1876.

As in other arts, so in that represented by the litter, the Japanese have reached the acme of the hand epoch in carrying. It would take the student too far away from primitive methods to discuss all the varieties of apparatus in Japan by means of which individuals are borne about. In brief, there are two types, the hammock beneath a pole and the true litter inclosed. The two words "kago" and "norimono" are supposed to set forth these two, but Mr. Kota Nakahara, of the Japanese legation in Washington, says that "there is not very much difference between the words kago and norimono. We call norimono almost

every kind of kagos and jinriki and carriages which would transport us from place to place, and call kago only the kind of kago proper, which resembles the litter. It is thought both kago and norimono are what we call kago. Of course, there is a special name for each different kago, and those names are varied according to the localities. The word norimono is the name for the genus and kago is for the species."

The Korean, according to Carles, uses a rude form of chair for travelers not differing from the Chinese and Japanese types. The officials are borne in a small open chair, without legs, fastened on the top of a pair of carrying poles united by cross bars, like a bier without legs. Four men, tandem, walk between these poles, two in front and two behind, and hold up the great man by means of a short pole to each pair of bearers. A fifth person walks at the side to steady the carriage (fig. 231).



Fig. 230.

KOREAN CHAIR.

From a figure in Carles' "Life in Korea."

The carrying of persons was known among the Muskogean tribes in the Southern States of the Union. The gentleman of Elvas describes the ladie of Cutifachiqui as coming out of the town in a chair whereon certain of the principal Indians brought her to the river. The precise form of the chair is not given, to enable us to decide whether it was a hammock or swinging bed or a litter borne by four.¹

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Fig. 231.

KOREAN OFFICIAL BORNE OF FOUR.

From a figure in Carles' "Life in Korea."

The pottery and tapestries of Peru show persons of distinction borne by two, not in a chair slung between the poles, but in a chair or on a

¹"The Discovery and Conquest of Terra Florida," Publications of the Hakluyt Society, 1851, pp. 56, 67, 166.

platform quite above the poles.¹ Such a feat is impossible, and the omission of the other two indispensable carriers or a second pole must be due to ignorance of perspective. (Fig. 232.) In this connection Ratzel figures a curious little image from Colombia (fig. 233), in which the head-band is used in carrying a man.

"In this little town of the New World," (Santa Catharina, Brazil), says Langsdorff, "a sort of sedan chair is used, called cadeirinhas, in which the rich are drawn in state by their negro slaves. They are not like our sedan chairs, closed up with doors and glass windows, but rather resemble an easy chair with a high back. They have a canopy," etc.² (Fig. 234.)

The bier, the sedan, and the litter become historically the travois for dog and horse, and after that the cart and the carriage. In one or two places in the world the carrying of men and women on human backs survives. This is especially true in mountains where there are no beasts to ride and two or more can not work together. In such places there is naught to do but for the tough and professional carrier to take his passenger upon his back, and this indeed he does.

In the Brockhaus Atlas of Ethnography (pl. 10) will be seen a Dyak carrying chair, very interesting in this connection. The Dyaks are in the habit of carrying

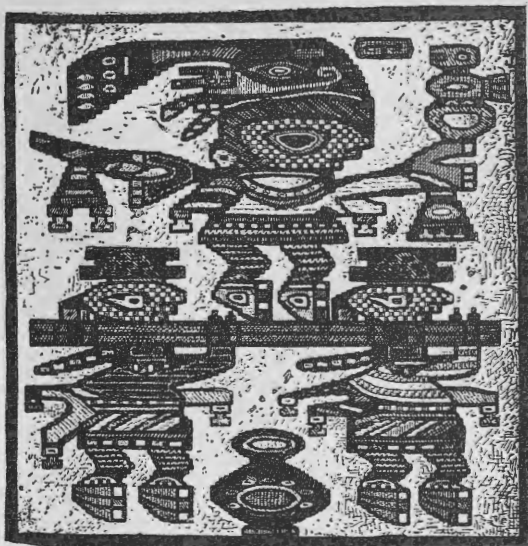


Fig. 232.

CARRYING MOTIVE IN PERUVIAN TEXTILE.

One-third size.

From a figure in Wiener's "Pérou et Bolivie."



Fig. 233.

CHIBCHA CLAY FIGURE FROM COLOMBIA, SHOWING METHOD OF CARRYING BY MEANS OF A HEAD-BAND.

From a figure in Ratzel's "Völkerkunde."

¹ Wiener, "Pérou et Bolivie," pp. 609, 639; also Reiss and Stubel, "Necropolis of Ancon," pt. VII, and "Zeitschrift für Ethnologie," Berlin, 1895, XXVII, p. 307.

² Langsdorff, "Voyages and Travels," London, 1813, I, p. 47.

loads on the back in frames hung from the forehead by a strap, precisely after the American Indian fashion. Now the carrying chair is borne in the same way. It is a low seat, whose hind legs extend 3 feet, more or less, above the seat. The front legs are inclined backward and are



Fig. 234.

THE CARRYING-CHAIR IN BRAZIL.

From a figure in Langsdorff's "Voyages and Travels."

extended upward till their ends meet those of the hind legs, where they are securely fastened together. The *tamenes*, or porters, at Timbala, in Yucatan, carry a full-sized man on their backs in a chair or frame specially designed for that purpose.¹

MAN IN TRACTION, AND THE DOMESTICATION OF RIDING AND HAULING BEASTS.

After inspecting the primitive man as the traveler in connection with his innumerable inventions, and also as a carrier, the study would not be complete without giving attention to man as a traction force.

It will be seen in a subsequent study on primitive domestication that the animal comes in merely to transfer the load from man's back to its own. The hauling of loads is in the same line. Before there were traction beasts there were

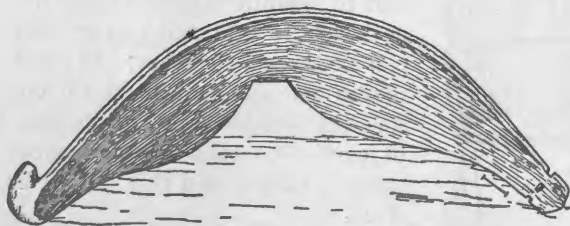


Fig. 235.

ESKIMO BREAST-YOKE USED IN HAULING.

Cat. No. 30925, U. S. N. M. Collected by E. W. Nelson.

traction men, and in our own day one can not go amiss for men and boys and women harnessed to objects dragged on the ground, on the snow, or along the water, or to sleds and wheeled vehicles. In order to perform this duty well there is need of harness for men (figs. 235 and

¹ Désiré Charnay, "Les Anciennes Villes," Paris, 1885, p. 433, with figure.

EXPLANATION OF PLATE 25.

GROUP OF ASSYRIAN WORKMEN HAULING A WINGED BULL.

Only man power is involved, using the sled, the cart, cooperative traction, the roller, and the lever.

The following features must be noted:

(1) A low sled, or drag, with runners of heavy timbers, extra thick at the bottom, or shod.

(2) A rack or framework about eight feet high to steady the image. The uprights pierce the crossbars of the sled and are crossed by horizontal beams joining their tops or middles.

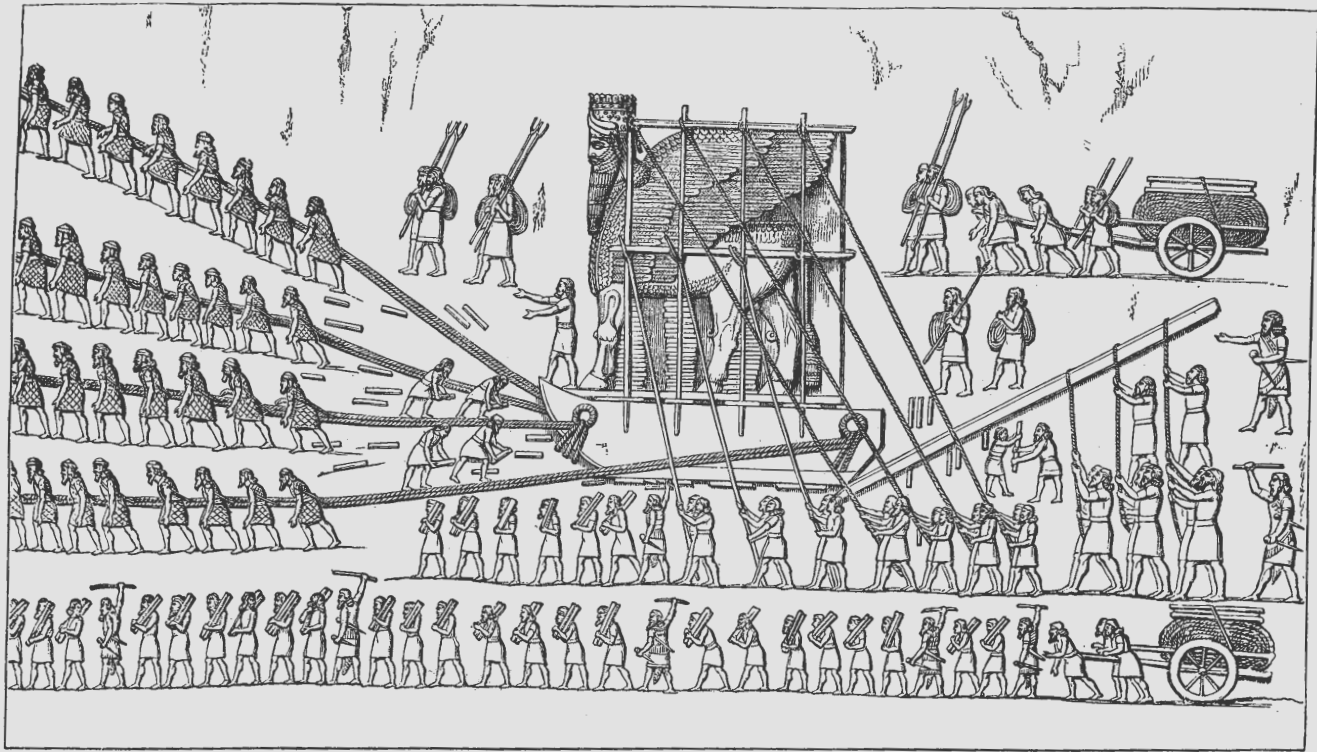
(3) Guy ropes and forked props attached to, and placed against, the top and middle rails, respectively, to steady the image on the sled. These are held at their lower ends by two men each, fourteen in all.

(4) Long drag ropes, four in number and double, fastened through eyelets in front and back of the runner, with men attached to them by means of bricoles. These men are evidently dragging the sled.

Those who saw the southern rivers before the civil war will remember that the slaves hauled ashore the heavy seines in precisely the same manner. It will be remembered also that in Holland the small boats are drawn up an incline from one canal to another by ropes attached to the stern and wound over a windlass. As soon as the center of gravity passes the summit of the causeway, the stern ropes are relaxed.

(5) Power is multiplied by the use of the lever and the roller in combination. Comparing this with another Kuyunjik inscription, it will be seen that a fulcrum is put beneath the lever near the sled, and that the men pry up that part by means of ropes over the long arm. This may be used as a walking lever to keep up continuous motion, or for the purpose of setting the roller under the sled and giving it a start. One may see nowadays two men moving a heavy locomotive along a track by steel crowbars worked between the track and the driving wheel.

It will be remembered that all the megalithic monuments of the world were erected in the hand epoch. No great teams of beasts are shown on the monuments, and no capstans with sweeps worked by animals. It was the weakness of the human body that necessitated cooperation,—strong ropes, lubricants, rollers, inclined planes, levers, wheels, etc., and these in turn provoked the highest expression of their capacity. (Layard, "Babylon and Nineveh," New York, 1853, Chapter V; also Rawlinson, "Herodotus," New York, 1872, frontispiece.)



GROUP OF ASSYRIAN WORKMEN HAULING A WINGED BULL.
Layard, "Babylon and Nineveh"; Rawlinson, "Herodotus," frontispiece.

236), which, by and by, will become harness for dogs, reindeer, camels, yak and cattle, goats, elephants, horses, and mules, and the varied occupations thus engendered will have a splendid efflorescence in art and mythology.

The simplest harness for men is, in military phrase, the bricole, which is a loop to go over the head and a piece of loose rope or line extending therefrom constituting the single trace. The reindeer in Lapland now wear it, and so do men innumerable on the canals and at the fishing shores. In the old days of long seines the haulers could be seen wearing the bricole, now pressing with the breast, now with one shoulder, now with the other, now backing, with the loop athwart the neck or the shoulders so as to watch their work. There did not seem to be a contortion of the human body that could not usefully employ the bricole in traction. It was collar, breast strap, and breeching all in one. At the end of the loose rope or trace was a Turk's head knot, by means of which by a single overlap the seine hauler could hitch and unhitch himself from the cork line. The Eskimo have invented a variety of toggles, frogs, and buttons to facilitate attaching and detaching the hauler from his load, to be illustrated further on.

The number of locomotives in the world is 105,000, aggregating 3,000,000 horsepower, or 125,000,000 of manpower. The writer does not know the amount of horsepower in navigation, but it is very great. There are not over 200,000,000 able-bodied persons in the world, so the steam traction power and the power of human backs are about equal. But while steam traction is the climax of the industry human traction is not superseded.

The first mechanical means of transport by land was doubtless the sled. It was employed by the Egyptians in the transfer of large masses of stone.¹ In one sculpture a statue drawn by 172 men is shown. There are oil men, bosses, and relays. In Assyria, also, the sled was used to haul heavy loads by means of a great multitude of men (pl. 25). There is no better example to be found of the two principles often mentioned in this paper—first, that it is the manual part of a device that is greatly modified by invention, and second, that the history of the past has been chiefly the evolution and glorification of the hand

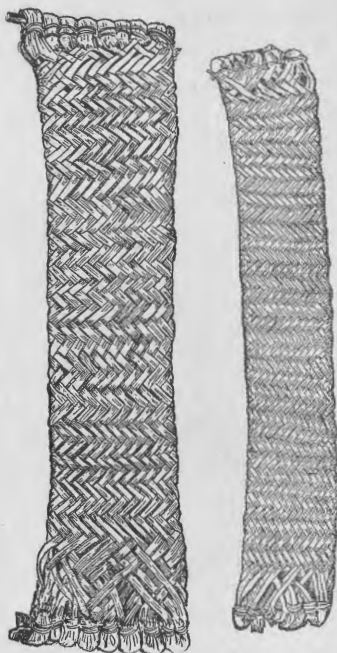


Fig. 236.

ZUÑI BREAST-BANDS USED IN HAULING.

Cat. No. 70962, U. S. N. M. Collected by James Stevenson.

¹Lepsius, "Denkmäler," II, p. 134; Erman, "Life in Ancient Egypt," p. 477.

or of the power of man. The industry of these two great nations was all anthropotechnic. Among the Eskimo there is no plainer looking sled than the ones shown by Wilkinson and Layard for moving the ancient gods; but there is an immense variety of activity going on to move the sled—concerted action, relaying, carrying, prying, and commanding. There is also a goodly and sufficient array of apparatus, ratcheted tracks, strong ropes, oil, levers, and shore poles to decrease friction and to increase power at the expense of time.

In the U. S. National Museum the sleds are associated with primitive life and with snow. But in many places in the United States and elsewhere sleds are employed to run over fallen grass and on the very steep hillsides by the backwoods farmers and lumbermen. As these harvesters of nature take all from the soil and restore nothing, their hauling



Fig. 237.

PASSENGER SLED FROM MADEIRA.

From a photograph in the U. S. National Museum.

is downhill and they have no difficulty in getting their forest product and their crops to the highway. Wagons would be out of the question unless the wheels were extremely low. The island of Madeira is quite famous in this regard, where sledding becomes a pastime (fig. 237).

It must not be forgotten that in all countries where snow lies on the ground long enough to become packed, hauling and traveling over the snow are the easiest and swiftest. As far south in America as the

New England and the Northwestern States hauling is preferably done in winter on sleds, largely with oxen. The frosts render the roads impassable in spring, and the common country road is disagreeable most of the year. It is also a season in which other work is dull. When one reads such works as Bush's *Reindeer, Dog, and Snowshoes*, it is pleasant to reflect on the little difference in this regard between many of the methods of cultivated New England and savage Siberia.

The characteristics of the best sled have to be studied out for each area. First and fundamentally, in sled-using lands sled-making material of the best quality is not always forthcoming. Men have to use what they can get—whale's jawbone in one place, driftwood in another, and poor standing wood in a third. Not discouraged in this, the fertile genius discovers and develops the qualities and versatility of rawhide, of braces, of splints, of form, of harness, of administration. No doubt a

great many conferences and much cudgeling of the head have taken place. Captain John Spicer, who spent eleven winters among the Eskimo, tells of an inventional contest and debate between two sled builders in Cumberland Sound. The old-fashioned sleds have narrow runners, but one builder declared that broader runners would do better. To prove his assertion he made two sleds, loaded them exactly alike,

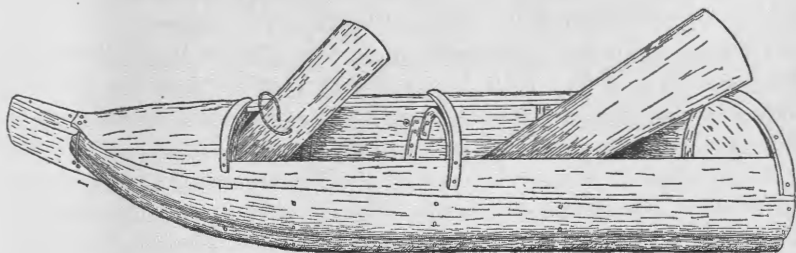


Fig. 238.

LAPLAND PULK, OR KEELED SLED.

Cat. No. 14800, U. S. N. M. Gift of the University of Christiania.

fastened each one to the end of a spar, hitched a line to the middle of the spar and pulled. The sled with broad tread moved first and easiest every time.

To make the sled runners broad and smooth, the wood and shoes are, by most peoples of Asia and America, treated to a coat of blood and water, and in one place of salt. This preparation is said to stick faster than merely frozen water; but almost universally the hyperborean

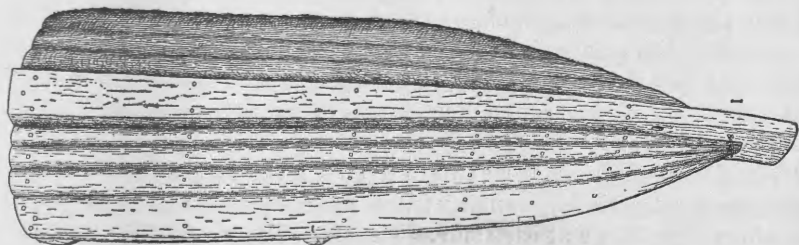


Fig. 239.

BOTTOM VIEW OF LAPLAND PULK.

teamsters go provided with the means of coating the bottom of the sled runners with a pellicle of ice, just as the drivers used to provide the tar bucket in days of wagoning.

The Norwegian sled is 10 feet long, 1 foot 6 inches wide, and 6 inches high. It is made of ash wood, and all the parts are firmly lashed together with rawhide. The runners are nothing else than a pair of skees, and are superior to the flat toboggan.¹

Example No. 14800 in the U. S. National Museum (figs. 238, 239) is

¹ F. G. Jackson, "The Great Frozen Land," London, 1895, p. 132.

called a pulk or Lapland sled. As will be seen from the drawing, it is built up like a boat on a keel, above which rise on either side strakes of plank, wide at the rear and tapering to a point in front, where they disappear in the widened end of the keel. The whole is fastened together with treenails passing through stout wooden bows, the ends of which overlap at the widest part. The rear end is set in like the head of a barrel. The affair is decked over with movable sliding planks, so that it may instantly be adapted to freight or passengers.

The specimen here represented is the gift of the University of Christiania, and has with it a reindeer properly harnessed and the driver in costume sitting in the hold. At a glance he reminds one of an Eskimo sitting in a kaiak from which the stern has been sawed off.

As an element in the congeries of sled inventions, it is a compromise between the sled and the boat. The substitution of one runner for two, the rounding of the strakes on the outside to furnish a keel effect, however the vehicle might lean, especially the inclosed and comfortable passenger, all suggest settled life, short journeys, beaten roads, and social comforts.

The harness and the reindeer will be discussed in another paper. It is a very interesting fact that Nansen, in studying perfect economy in regard to his boat for landing in east Greenland, came upon the problem of the pulk or sled with a hull and runners in one.

The Samoyed sled is about 9 feet long and 30 inches wide, of pine, with large, thick runners curved up at the front 2 feet. On each side are four uprights, close together toward the rear and sloping inward. These are united by crossbars, which act as sills of the floor. Side frame pieces (called bereznias) extend from the top of the bend of the runners to the rear end of the sled. Baggage is heaped on the cross sills, and the driver sits thereon or upon a seat in front of it. The woman's sled is larger, and long strips of rawhide painted red hang from the bereznias.¹

The Samoyed drives from two to five reindeer abreast. Each one is harnessed to the sled by running traces of seal hide attached by chulki, of which there is one at each side. The chulki is a tackle block or dumb sheave of ivory or wood through which the trace runs from the near to the off-side reindeer. Jackson figures four of them, and they may be compared with similar objects on Eskimo harness. But the Samoyed man, like the German woman with her dog team, does a good part of the work himself, and before the days of the tame reindeer he did it all.

Towing or tracking along the canals and on the rivers of China is done universally by men. Each coolie engaged wears over one shoulder and under the opposite arm a bricole or harness of bamboo, previously explained (page 545). From this becket or loop a piece of rope extends to the main line by which the load is hauled, after the same fashion as the negro seine haulers in Virginia fifty years ago.

¹ F. G. Jackson, "The Great Frozen Land," London, 1895, pp. 115, 118, figure.

Of the sleds about Berezovsk, in northeast Russia, it is said that those used for a long voyage have the form of a box, the interior being fitted with beds of feathers and furs. The little air openings are closed by broad curtains. The passenger lies down.¹ This form will be seen in every part of Siberia where the Russians have established themselves and their postal methods as far east as Kamchatka. The pavoshka is also suggestive of the inclosed toboggan of central and northern Canada.

Schrenck figures the Amur sled, and it will be seen that its form is quite the universal pattern. It may be seen in possession of children in civilized lands wherever there is snow. Its parts are, the runners, gently sloping upward; the posts, mortised into the runners; the cross-bars, set into the posts and held by lashing or pins; the top rail, into which are mortised the posts. The rail is securely fastened to the runner in front.

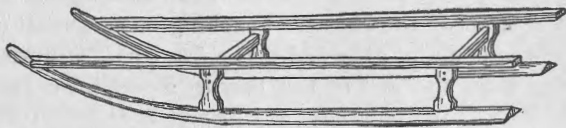


Fig. 240.

BUILT-UP SLED.

From a figure in Schrenck's "Reisen und Forschungen im Amur-Lande."

Omitting tenons and mortises, the framework is fundamental. (Fig. 240.)²

The narta, or sled, of the Tungus is from 8 to 10 feet long, 2 feet wide, and the floor is 1 foot above the snow. Above this a few inches is a light railing, on each side which keeps the load in place. The runners are of white birch, about 4 inches wide, flat-bottomed, and the parts are lashed together with rawhide thong. In front of each sled is a stout bow to which the long seal thong or trace is attached.

The Korak about Yamsk, on Okhotsk Sea, when the rough snow becomes destructive of sled runners, to protect them as well as to improve the running, every two or three hours turn the narta or sled over and with a piece of deerskin saturated with water, moisten the shoes and in a few minutes they are incased in ice. A bottle of water is carried by the driver beneath his furs next his body.³

Example No. 73018 in the U. S. National Museum (fig. 241) is a model of a Kamchatkan sled, consisting of the following parts: Runners, uprights, sills, bed or bottom rails, traction bow, and netting with its upper rail.

The runners are enlarged examples of the Lapland and Eastern sledge turned up in front to the level of the bed or seat.

The posts perform the following functions: At the lower end they are inserted for a short distance into the upper margin of the runner by a shallow tenon and mortise. Each one is perforated above this point and a sinew cord is rove through these perforations, and holes

¹ Eve Felinska, "Le Tour du Monde," Paris, 1862, v, p. 236.

² "Reisen und Forschungen im Amur-Lande," iv, p. 492.

³ Bush, "Reindeer, Dogs, and Snowshoes," p. 322.

bored through the runners diagonally in pairs so that the sinew cord on its lower loops is countersunk beneath the runners to prevent abrasion. Each upright is bored through its middle and the end of a sill fits exactly into the bore or auger hole. Above this point the upright extends far enough to receive the top rail.

The bed or seat of the sled is a long thin plank resting on the sills, and extending as far front as the flat portion of the runners.

The rail is a cylindrical rod or pole passing a short distance above and entirely around the sled, let into the tops of the upright pieces, and a network of sinew cord is laced through holes on the edge of the bed-piece and around the rails by a series of half hitches. The front of the bed is let into a stout piece of wood securely lashed to the traction piece, which is in the form of an oxbow, securely fastened in turn to the front of the runners, reaching back a short distance from the front to the bed and attached to the front pair of uprights by a cable extending from the end of the bow to a notch on the back of the upright.

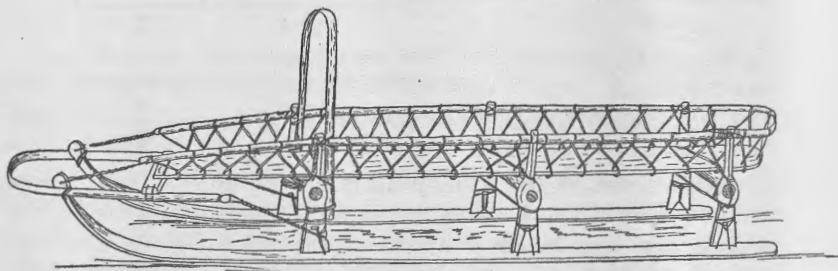


Fig. 241.

BUILT-UP SLED WITH BODY OF NETWORK.

Kamchatka.

Cat. No. 73018, U. S. N. M. Collected by Dr. Leonhard Stejneger.

Across the top of the bed from upright to upright there is a cable of sinew cords held together by a figure of eight seizing, common among the Eskimo in many of their harpoon lines.

Above the rail at the first pair of uprights is another bow like the traction piece in front, which the rider is said to hold firmly in going over precipitous or difficult places. Length, 21 inches. Collected by Dr. Leonhard Stejneger. Fridtjof Nansen speaks of a low hand sled, skikjaelke, on broad runners, resembling ordinary skees.¹

Captain Cook says of the Kamchatkan passenger sled, that the length of the body is about $4\frac{1}{2}$ feet and the breadth 1 foot. It is made in the form of a crescent, of light, tough wood, fastened together with wicker-work, and among the principal people is stained with red and blue, the seat being covered with furs or bearskins. It has four legs, about 2 feet in height, resting on two long, flat pieces of wood of the breadth of 5

¹ "First Crossing of Greenland," London, 1890, 1, p. 33. Compare figure in "Zeitschrift für Volkskunde," Berlin, 1891, p. 430, and Senate Ex. Doc. No. 92, Fifty-third Congress, third session.

or 6 inches extending a foot beyond the body of the sled at each end. These turn up before somewhat like a skate, and are shod with the bone of some animal. The carriage is ornamented at the forepart with tassels of colored cloth and leather thongs. It has a crossbar, to which the harness is joined, and links of iron or small bells are hanging to it, which, by the jingling, are supposed to encourage the dogs.¹

The riding sled of Kamchatka is a happy combination of a small hooded body on a pair of skees or Norwegian snowshoes for runners. There is one in the U. S. National Museum (Cat. No. 2811), all the parts fastened together with rawhide of different colors. The hood is a piece of brown leather, slashed and drawn through with particolored leather thongs so as to resemble weaving. The writer has seen the same imitation of weaving on Eskimo boxes and bags and on a box in Zuñi, New Mexico.

Langsdorff makes the important statement that the sleds of Kamchatka are of uniform width, so that when the track is once made all will run in the same lines. A good sled weighs about 20 pounds. There are two varieties, as shown above, the riding sled and the freight sled. The runners are a trifle farther apart in front. The driver always sits sideways, ready to spring out at any moment. The freight sleds, nardeus, resemble a long bench, with a guard on each side set upon short feet. The runners are the same width apart as in the riding sled. Belonging to the sled is the oerstel, a strong stick, slightly angular, with a spud of iron at one end and thongs of leather at the other, into which iron rings are plaited for a rattle. If the driver wants to increase speed he rattles the oerstel, to stop the sled or to slow up he sticks the iron spike into the snow in front of one of the crosspieces. The oerstel also serves as a lever in upholding and righting the vehicle. In short, this implement is lever, brake, whip, and voice to the driver.²

The Chukchi sled runner is a long pole, cut away in the middle and bent until the two ends almost meet. In this stage of the manufacture either part would serve for top rail or runner.

Nordenskiöld figures the essential parts of another style of Chukchi sled as follows:

1. Framework of curved "knees," four pairs.
2. Runners below and body rails above, framed to these knees.
3. A long, thin hoop passing on top of the body sill halfway and under the bottom of the runner all the way. The floor is of slats. These are for riding. The pack sleds are of stronger wood, with runners not bent back. Some of the light ones had a body of splints covered more or less with reindeer hide.³

The sled and its outfit occurs as a motive in the art of both Chukchi and the Eskimo. Over and over again on the drill handles and pipes

¹ Cook, "A Voyage to the Pacific Ocean, 1776-1780," III, p. 374.

² Langsdorff, "Voyages and Travels," London, 1814, III, p. 288.

³ Nordenskiöld, "Voyage of the Vega," New York, 1882, p. 375, with figures.

teams of dogs are moving along with or without load. The **Chukchi** adds the reindeer team and shows the driver shaking the oerstel.¹

Hooper, speaking of the Chukchi, says:

The Tuski traveling sled—for there are two other kinds—is constructed principally for speed, being exceedingly light and of elegant form. Six or nine arches of wood, let into flat runners, support a seat about 5 feet long and 14 inches broad, connected at the head with the runners by their springy curves. A sort of basket is formed at the back of the sled, and broad strips of whalebone are secured under the wooden runners. Braces and uprights further bind the parts together, and all are fastened with whalebone. * * * A single thong of seal hide from the under part of the seat serves to attach the dogs, which vary in number from two to ten; as far as eight they all run abreast, the single traces of the harness radiating from the main thong, to which they are secured by loops of ivory.

Hooper describes the dogs in full.²

Among the Eskimo in this last century, partly their own invention and partly introduced from the eastern continent, were to be found several classes of sleds. These, of course, are in addition to the make-shifts soon to be mentioned.

1. The bed on solid runners, the sled par excellence, repeated in the toy sled and in the common peasant examples. These are common further east and in hand work.

2. The bed on pairs of bent sticks or knees spliced together or arched, which serve for both posts and sills.

3. The bed resting on a square, mortised framework, and frequently made with great care.

4. The bed flat on the ground, the toboggan, or the common stone buck.

Nansen figures an ideal sled, with broad runners, curved at both ends, having a yoke for draft and bow behind, which should be compared with the Asiatic styles.³

To attach himself to his sled and to his load, the Eskimo uses his hand and a very simple harness or toggle now to be described.

Example No. 43717 in the U. S. National Museum (fig. 242 a, b) is a pretty toggle from Cape Prince of Wales, cut in imitation of a seal. The lines of feather ornament on the back and the prettily carved bands about the wrists are noticeable. The latter is in imitation of the embroidery around the tops of boots, with the fluffy band of Arctic fox fur. The holes are concealed on the underside, bored diagonally, so as to meet in the object and not appear above. The Eskimo are adepts at this "blind-stitching" method.

Example No. 43718 in the U. S. National Museum (fig. 242 c), of walrus ivory, is a button for many uses, carved to represent the head of a fish. On the end and on the underside holes have been bored at right angles, meeting to form a continuous cavity. The striations and the

¹ Figured by Nordenskiöld, "Voyage of the Vega," New York, 1882, p. 498.

² "Tents of the Tuski," London, 1853, p. 42.

³ "First Crossing of Greenland," London, 1890, 1, p. 34.

point work of the drill are neatly shown, as well as the use of the file or knife, to convert a conical hole into a cylindrical one.

Example No. 38551 in the U. S. National Museum (fig. 242 *d*) is an ivory hook with the eyelet in the plane of the hook. In this example the whip splice common among the Eskimo is shown. Where a knot in a greasy line that can not slip or jam is needed, this is, of course, the best. In some examples the splicing is continuous.

Example No. 37991 in the U. S. National Museum (fig. 242 *e*) is a good specimen of the Eskimo hook attachment carved from walrus ivory. The eye is bored transversely to the plane of the hook. One or more of these forms would be employed effectively by the Eskimo in lieu of tackle. The ivory is so smooth and the rawhide lines so saturated with grease that there is very little friction.

Example No. 44155 in the U. S. National Museum (fig. 242 *f*) is from Cape Darby, Alaska. The toggle represents a swimming seal. The holes are mortised across the line of the body. The ends are tied in a true lover's knot, and then the whole joint, as well as the parallel part of the line, are beautifully served with rawhide string.

Example No. 33673 in the U. S. National Museum is a drag or harness for a man, to attach him to any load he may have to draw. It is held in the hand, the line passing between the middle and the ring finger.

The toggle is a bit of walrus ivory, cut with pointed flutes. The two holes for the strap are joined outside by a double countersink. The two ends of the strap are united and the projecting extremities wrapped down with fine rawhide line. No. 38558 (fig. 242 *g*), from the Yukon district, is a plain example of the same construction, and there are many more in the collections.

Example No. 38552 in the U. S. National Museum (fig. 242 *h*) is the toggle of a drag from the Aleutian Islands, made of walrus ivory, in



Fig. 242.

ESKIMO TOGGLES AND HARNESS OR CLOTHES HOOKS.

Alaska.

imitation of a fox or wolf doubled up. The line hole is bored transversely. This object has seen much use, as the line has worn a deep furrow in the ivory. No. 63819 is a precisely similar object from Point Hope, in form of a seal.

Example No. 43848 in the U. S. National Museum (fig. 242 *i*) is a toggle from Unalakleet, on the east shore of Norton Sound, representing a seal floating on its back. This specimen was designed for hard work. Two holes are mortised diagonally from the sides into the stomach. This was done after the manner of the ancient carpenter, by boring holes at the ends of the mortise and cutting away the intermediate material.

Example No. 45356 in the U. S. National Museum is a stop or toggle on a loop or becket not here shown. The toggle or stop represents a number of seals' heads. The object is perforated once longitudinally and twice transversely. With lines through the latter it would become a toggle. In its present form it is a stop for a running noose or ivory

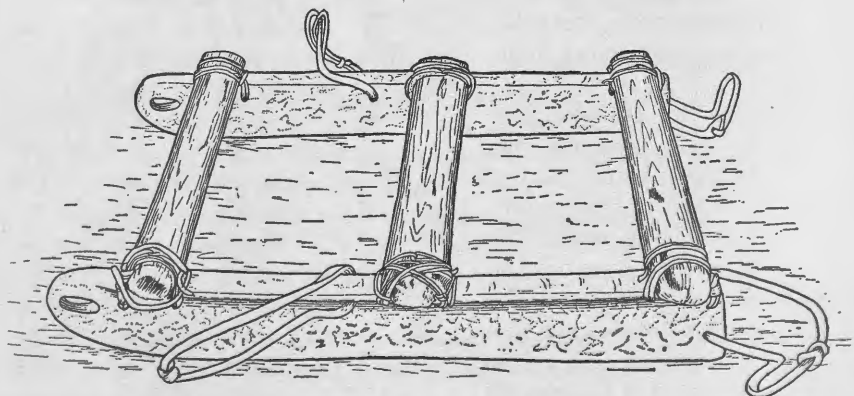


Fig. 243.

HAND SLED WITH RUNNERS MADE OF WALRUS TUSKS.

St. Lawrence Island, Alaska.

Cat. No. 63587, U. S. N. M. Collected by E. W. Nelson.

eyelet of some kind. The rawhide line has its ends fastened together in the usual way, but the longer bend is served with rawhide string by a series of half hitches put on alternately by right and left turns, forming a series of double loops. The effect is as pretty as the method is simple.

Concerning these traction hooks and toggles, it may be said that the beautifully carved specimens of which those described are types, and of which there are hundreds in the U. S. National Museum, are all modern and effected with metal tools obtained from Europe and Asia.

Example No. 63587 in the U. S. National Museum (fig. 243), is a short sled from St. Lawrence Island. The runners are two strips from enormous walrus tusks, thin below and winged or margined above. Each one of these runners is pierced in nine places. At the front elliptical holes are cut for the attachment of the harness. Three pairs of holes are bored front, middle, and back for the lashing of the crosspieces, and

one hole is bored in the rear for rawhide loops or beckets. The ninth hole is bored just in front of the middle bar for additional beckets useful in lashing the load to the sled. These beckets are made of rawhide, one end slit, the other fastened through the slit by a weaver's knot. The three crossbars are made of driftwood, roughly cylindrical, somewhat flattened beneath to fit on the widened surface of the runner, and having two parallel notches cut almost around the upper part just above the runner. The crossbar is fastened to the runner by a lashing of rawhide which passes again and again through the runner over the end of the crossbar, back through the runner and over the other parallel notch of the crossbar, this process being repeated several times and fastened by simply tucking under. In the middle crossbars the end is

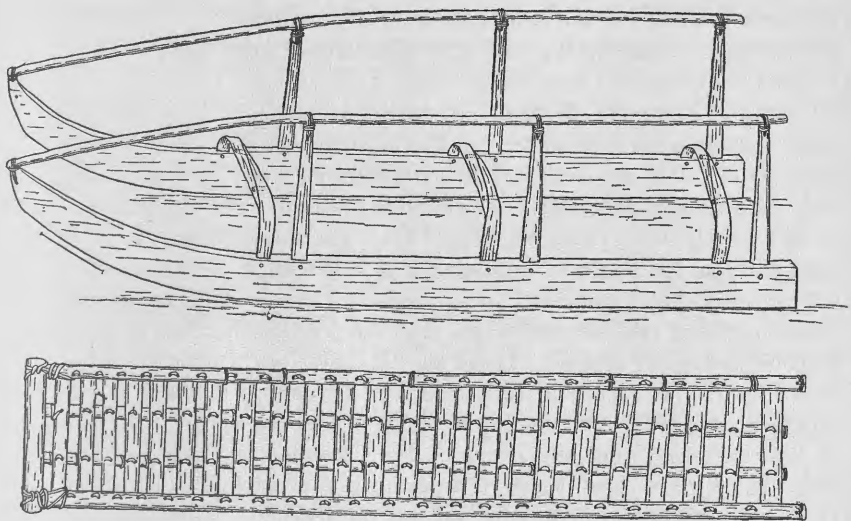


Fig. 244.

BUILT-UP SLED FROM NORTON BAY, ALASKA.

Cat. No. 45335, U. S. N. M. Collected by E. W. Nelson.

fastened by a cross seizing, because the outside notch has been somewhat worn away. Such a vehicle takes the place of the wheelbarrow or common hand cart, and is used by man or dog traction in bringing in game short distances, and could never be utilized for long journeys. Example 15597, from Poonook, is double. Length of sled, 14 inches; length of crossbars, 15 inches. Collected by E. W. Nelson.

Example No. 45335 in the U. S. National Museum (fig. 244) is the model of a sled, consisting of runners, three pairs of knees, bed, uprights, and rails, from Norton Bay, Alaska. The runners are stout bits of wood turned up in front to the level of the bed. The knees are inserted or mortised into the upper margin of the runners in a crude way and fastened by pegs. The horizontal portions of the knees have been

beveled so as to splice neatly and appear as a single piece extending from runner to runner. These are fastened together by lashings of rawhide.

The uprights are slender posts mortised into the runners and fastened by pegs just back of the point of insertion for the knees. The top rails fit into notches at the upper ends of these, and are held down by lashings. The bed or seat of the sled consists of four parallel slats or strips of wood extending from the rear to the front of the runners. Athwart these slats, above the two middle ones and beneath the two outside ones, are twenty-four cross slats fastened to the strips by a continuous sewing of sinew cord, which passes through perforations in the slats and cross-pieces all the way, excepting that underneath the outer slats the ends of the cross-pieces fit in a sling and are not perforated. These two pieces are attached to a stout block of wood, which, with the ends of the runners and the front of the floor or bed pieces, are joined by a firm lashing of rawhide. Length, 10½ inches. Locality, Norton Bay. Collected by E. W. Nelson.

Example No. 30771 in the U. S. National Museum is a sled model from Norton Sound, consisting of the following parts: Runners, knees, posts, floor, and top rails. The runners, like a series from this and neighboring regions, consist of two stout pieces of wood turned up with quite a sharp curve in front. The knees are three pieces of wood on each side, in the shape of a quadrate or ship's knee, mortised into the top of the runner and held in place by a treenail. These knees are chamfered and spliced neatly, so that the load of the sled rests upon three semicircular arches. There are also three posts mortised into the top of the runners back of the knees, and extending upward to hold a railing on the side. On the top of these posts a hand rail is fitted into shallow notches, and held in place by a lashing of rawhide passing over the rail and down through a perforation near the top of the post. This is a common form of joint among the Eskimo. The floor of the sled rests on two sills. Across these there are fourteen slats running at right angles to the sills, and over the ends of the slats and against the upright posts are two long strips of wood holding the slats in place. In front of the floor and against the runners is a stout piece of wood, to which the team is attached. The sills of the floor are fastened to this stout piece of wood by rawhide thongs running through holes bored in the crosspiece and in the sills; but the strips or cleats on top of the slats are mortised into this stout piece of wood. The posts and knees are held in place in the runners by pegs. The two knees of each pair are fastened together by pegs and by lashings of rawhide. The slats are sewed to the sills by a continuous rawhide line passing through a series of holes bored down through them and the sills, one stitch being taken in each. The slats are attached to the upper side strips in a somewhat similar manner, only the sewing passes through the strips of wood and around the ends of the slats, each one being grooved for that purpose. The posts are fastened also to these strips of wood by a lashing of sinew.

Finally, there is a network of rawhide which is laid on diagonally between the upper rail and the strip along the top of the floor. This line passes backward and forward around each piece by a single turn, without knots. The knots in this sledge are half-turn netting knots, or what is called a "single bowline". In many cases the ends are simply tucked under and drawn tight. Length of model, $9\frac{1}{2}$ inches.

Example No. 48104, from Norton Bay, is of similar construction, except in minor details. In this model the parts are not sewed together with rawhide. Length, 23 inches. Collected by E. W. Nelson.

Example No. 169332 is the model of a sled in the U. S. National Museum, probably from St. Michaels, Alaska, consisting of runners, upright posts, sills or crosspieces, bed or seat rails, traction piece, and handle.

The runners are long, slender pieces of hard wood, broad below and narrow above, turned up in front twice as high as the level of the bed. There are five pairs of uprights mortised into the upper margin of the runners, raking backward at a slight angle and braced at the bottom with rawhide line seized through perforations in the upright and through the upper margins of the runners. This seizing is then neatly frapped and the ends tucked under. It is a very pretty piece of work.

The sills on which the floor or bed of the apparatus rests consist of pieces of hard wood, with their ends forming a cylindrical tenon fitting into an auger hole or round mortise.

The bed consists of two wide outer strips or framework, and between them six narrower pieces, parallel and equidistant. These middle pieces are not cut or bored at all, but the two wide outer pieces are mortised through for the insertion of the uprights. After the bed was in place a seizing of rawhide line was carried backward and forward, over and under the slats; and around the outside of the uprights, and a frapping passed around between the slats, so as to form a perfect brace in every direction, holding the slats firmly to the sills and forming a perfect separation for the parallel parts of the bed. The outer rails of the bed pass forward and are bent upward to correspond with the ends of the runners. This is a very neat piece of rawhide work.

The rail passes along the top of the uprights, which are mortised into them and held down by seizings of rawhide passing through the upright and over the rail, neatly frapped. The front ends of these rails bend downward from the foremost upright and are neatly seized to the outside rails of the bed. A network of rawhide joins the outside rails of the bed to the upper rail, formed by three parallel warp lines passing through the uprights, and a wedging made by a series of half hitches passing through the outer rail of the bed and the upper rail at equal distances, forming rectangular spaces.

The traction part consists of a bow seized to the foremost uprights, strengthened in front by a stout bit of wood just in front of the upper part of the runners.

The handle of the sled consists of a framework of wood very much like the handle of an old-fashioned horse rake. The ends pass down

and are seized to the second pair of uprights. The side pieces of the handle are attached to a crosspiece at the rear end of the sled and reseized to the upper rail. Outside of the handle two rawhide lines double and cross each other, neatly served with the same material. This whole apparatus is of such extraordinary workmanship that it is easy to say that much was made with modern tools and that little is the work of the Eskimo. The form approaches that of the Kamchatkan sled, and the seizing and knots of the rawhide are thoroughly aboriginal.

Special attention is called to the very primitive fashion of network between the rail and the bed, in which the weaving is done by a series of half hitches. Length, 40 inches; width, 6 inches; height, $5\frac{1}{2}$ inches.

Example No. 48147 is constructed somewhat on the plan of the last number, but is very rudely made. The floor consists of four slats running longitudinally between the sidepieces which constitute the frame-

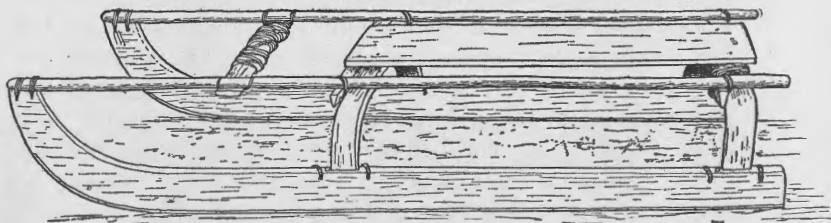


Fig. 245.

BUILT-UP SLED FROM TOGIAC RIVER, ALASKA.

Cat. No. 168567, U. S. N. M. Collected by Dr. Tarleton H. Bean.

work. Length, 2 feet $3\frac{1}{2}$ inches; locality, Anvik. Collected by E. W. Nelson.

Example No. 49111, from Tanana River, Alaska, is the model of a sled consisting of runners curved up at both ends and knees or supports for the floor or bed of the sled. There are three pairs of these supports, which are in the form of a ship's knee. They are slightly mortised into the upper part of the runner and secured there by a sewing of rawhide.

The two knees lie together parallel at the top and extend far enough to support the rails which form the bed. They are held together by a lashing of rawhide, which also holds down the rails in their places. At the ends the rails are mortised into the crossbars. The runners, the outside rails, and these crossbars, terminate together and are lashed with rawhide. This forms a very light but strong sledge. Length, 35 inches. Collected by E. W. Nelson.

On the Porcupine River, interior Alaska, Turner collected a sled (166974, U. S. N. M.) with the foundation like a toboggan and back and sides built up of dressed skins, and also a large lap robe of the same material. This should be compared with a precisely similar form in use in the Amur country.¹

¹ "Le Tour du Monde," Paris, 1, p. 106.

Example No. 168567, in the U. S. National Museum (fig. 245), from Togiak River, is a sled consisting of runners, two pairs of knees, and rails. The runners are stout pieces of wood, $1\frac{1}{2}$ inches thick above, 1 inch thick below, and 3 inches wide, shod with bits of antler and bone fastened on with pegs or treenails. They are turned up abruptly in front.

The knees are mortised into the upper margin of the runners and wedged in place. In order to bring the upper part of the knees closer

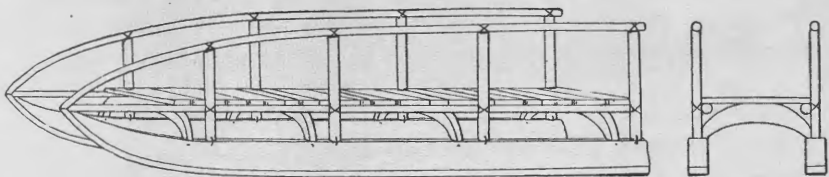


Fig. 246.

BUILT-UP SLED USED BY THE ÈSKIMO OF POINT BARROW, ALASKA.

From a figure in the Ninth Annual Report of the Bureau of Ethnology.

together, each one is chamfered and cut away so that the other can be partly let into it. These are then pegged together and sewed with rawhide lashing.

The rail consists of a round pole extending from the top of the runner in front on a level backward and lashed to the extended upper ends of the knees. Along the upper margin of the runners holes are bored and loops of rawhide inserted for the attachment of the load and for bracing. For traction a line of braided sinew is provided.



Fig. 247.

ÈSKIMO FLAT SLED FROM POINT BARROW, ALASKA.

From a figure in the Ninth Annual Report of the Bureau of Ethnology.

This sled is said by the collector to be used in the transporting of kaiaks. Length, 6 feet. Collected by T. H. Bean.

The sled of the southeast Alaskan is said to be about 20 inches in breadth and 10 feet in length, a sort of rail work on each side, and shod with bone, put together with wooden pins or with thongs or lashings of whalebone.¹

Murdoch describes two kinds of sleds at Point Barrow: (1) The kámoti, for carrying general freight (fig. 246); (2) the unia, low and flat, without rail or standards (fig. 247).

The kámoti consists of runners shod with strips of whale's jaw;

¹ Cook, "A Voyage to the Pacific Ocean, 1776-1780," III, p. 23.

standards, four on a side; sills for the flooring of slats; crosspieces or knees connecting the runners and supporting middle floor; rail on top of standards, raised above the floor and meeting the front of the runner. All these parts are fastened together by seizings of seal hide.¹

The second type of Point Barrow sled, the unia, is a small, low drag for conveying bulky objects and hauling umiaks across land ice.

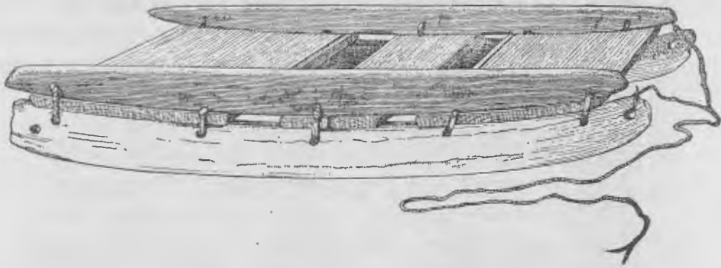


Fig. 248.

HAND SLED WITH RUNNERS OF WHALEBONE.

From a figure in the Ninth Annual Report of the Bureau of Ethnology.

Both kinds are made of driftwood and shod with strips of whale's jaw about three-fourths of an inch thick, fastened on with bone tree-nails. For carrying a heavy load over soft snow the runners are shod with ice. To each runner is fitted a shoe of clear ice, 1 foot high and 6 inches thick. From the ice on a pond they cut a piece the length of a runner, 8 inches thick and 10 inches wide. Into these they cut a groove

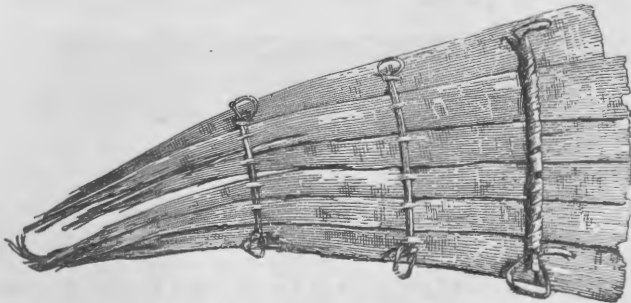


Fig. 249.

ESKIMO TOBOGGAN MADE OF BALEEN.

Point Barrow, Alaska.

From a figure in the Ninth Annual Report of the Bureau of Ethnology.

deep enough to receive the sled runner up to the crosspiece. The sled is fitted into the grooves and water poured in gradually. The sled is then turned bottom up and the ice shoes carefully rounded with a knife, then smoothed by wetting the naked hand and passing it over the surface until it becomes perfectly glazed.

¹ Ninth Ann. Rep. Bureau of Ethnology, p. 353.

Murdoch has carefully gathered the different methods of shoeing the sled. At Fury-and-Hecla Straits ice and snow are mixed. At Cumberland Gulf they pour warm blood on the under surface of the bone shoeing; water does not last so long and is more apt to chip off. About Repulse Bay they ice the runners by squirting over them water that has been warmed in the mouth. In eastern Labrador clay, tempered with hot water, is used first, and this is washed with water and polished with the hand. In the Mackenzie region also earth, water, and ice are used. At Pitlekaj, Nordenskiöld found the sled runners to be coated with a layer of two or three millimeters in thickness. Schwatka describes a custom in King Williams Land similar to the Point Barrow fashion.¹

Ray brought home from Point Barrow example No. 89889, U. S. National Museum (fig. 248), a small sled, with ivory runners 20 inches long and 13 broad. The bed or floor consists of three narrow boards laid crosswise, held down by a low wooden rail on each side. Each runner is a slice from a single large walrus tusk, with the butt at the back of the sled. The floor pieces, which are parts of a ship's paneling, are lashed

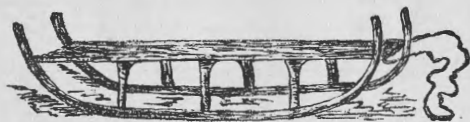


Fig. 250.

BUILT-UP SLED, USED BY THE KUTCHIN INDIANS.

From a figure in the Report of the Smithsonian Institution, 1866.

to the upper edge of the runners so as to project about one-half inch on each side. The rails flare slightly outward. The whole is fastened together by lashings of rather broad strips of baleen, passing through holes near the upper edge of the runner, around notches in the ends of the slats and holes in the slats inside of the rails. There are two lashings at each end of each broad slat or floor piece and one in the middle, at each end of the narrow one. The last and the ones at each end of the sled also secure the rail by passing through a hole near its edge, in which are cut square notches to make room for the other lashings. The trace is a strip of seal thong about 5 feet long and one-fourth inch wide, split at one end for about 1 foot into two parts. The other end is slit in two for about 3 inches. This is probably a broken loop, which served for fastening the trace to a dog's harness.²

Strachan Jones figures a Kutchin sled, turned up at either end. Upon this the women haul lodges, poles, and impedimenta.³ (Fig. 250.)

Example No. 7472 in the U. S. National Museum (fig. 251) is a sled from Fort Anderson, Mackenzie River district, consisting of two parts—the solid runners and cross slats. The runners are in the form of broad planks hewed out thick above and thin below, with a longer

¹Ninth Ann. Rep. Bureau of Ethnology, p. 353.

²Described and figured by Murdoch in Ninth Ann. Rep. Bureau of Ethnology, p. 355.

³Smithsonian Rep., 1866, p. 321.

bevel in front than in the rear. The five crossbars are mortised through the upper part of the runners in a very rude manner and fastened down with pegs. The line for hauling is attached to the front ends of the runners, just as in the case of the ordinary toy sled of boys in

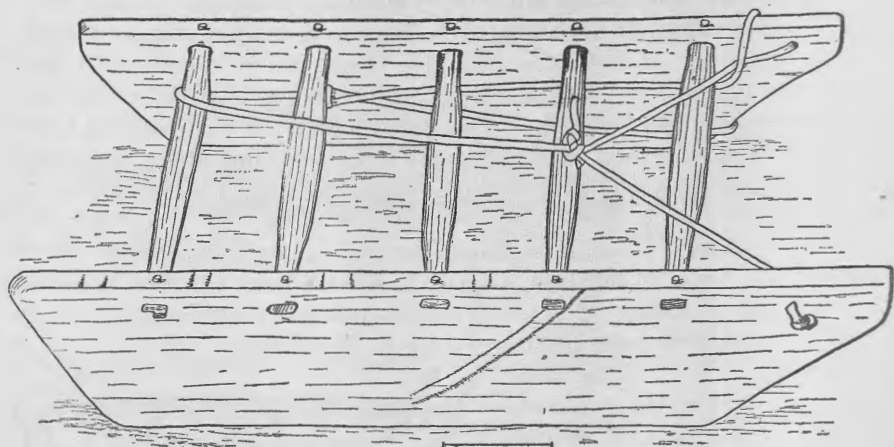


Fig. 251.

LOW SLED FROM FORT ANDERSON, MACKENZIE RIVER, CANADA

Cat. No. 7472, U. S. N. M. Collected by R. MacFarlane.

civilized countries. Although this was sent to the U. S. National Museum with a large collection of most interesting objects, it does not have the appearance of being an aboriginal form. Length, $7\frac{1}{2}$ inches. Collected by R. MacFarlane.

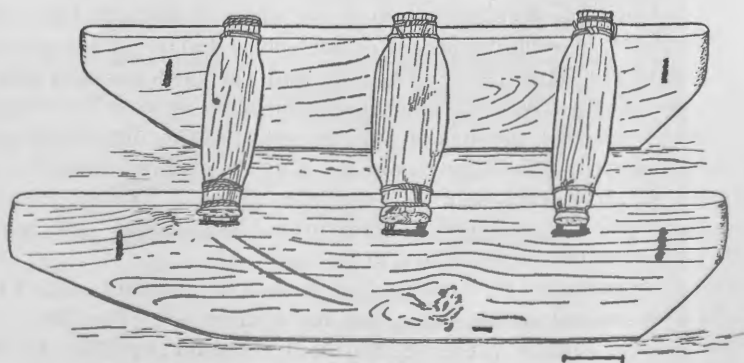


Fig. 252.

LOW SLED, FROM ANDERSON RIVER, CANADA.

Cat. No. 1638, U. S. N. M. Collected by R. MacFarlane

Example No. 1638 in the U. S. National Museum (fig. 252) is the model of a sled from Anderson River consisting of high solid runners and crossbars. The runners have a long bevel in front and a short one in the rear, and are sawed off at the ends. There are three crossbars,

broad in the middle and chamfered at the ends for the lashing. Near the upper border of the runners holes are gouged through the wood as long as the end of the crosspiece is wide. A double lashing passes over the end and through these holes so as to give a double bearing or brace. This is a very common method of attachment among the Eskimo. In the model the lashing is done with rawhide and sinew twine. This example reproduces with considerable faithfulness the construction of the aboriginal types. The shoeing on the bottom of the runners is fastened on with pegs of wood. Length, 12 inches. Collected by R. MacFarlane.

Example No. 7473 in the U. S. National Museum (fig. 253), is the model of a sled from Anderson River, northern Canada. The runners are wide, separate planks, curved up in front and beveled in the rear. Five crosspieces are attached to the top of the runners by means of sinew

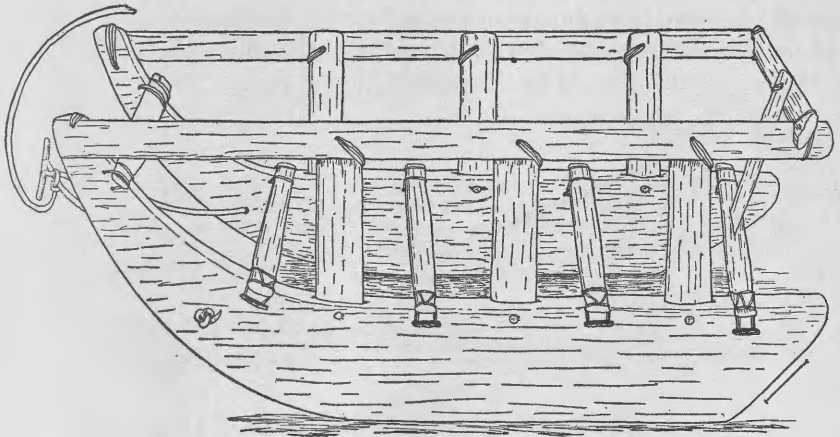


Fig. 253.

BUILT-UP SLED FROM FORT ANDERSON.

Mackenzie River District, Canada.

Cat. No. 7473, U. S. N. M. Collected by R. MacFarlane.

cord passing over the ends of the slats and through very rudely executed mortises near the edge of the runners.

The winding of the thread passes over the slats outside and inside of the runner so as to form an excellent yielding brace. Mortising is very uncommon among aboriginal peoples, and therefore the needs of the fur traders are to be suspected.

The front crosspiece is fastened on through two sets of holes instead of mortises. Between the slats on top of each runner six posts are mortised and fastened down with trenails, and a similar post is mortised through the upper surface of the hind slat. Along the top of these posts, at the sides and at the rear, are tight rails which extend out and are fastened to the upturned ends of the runners. The rails are sewed to the posts by means of babiche. Length, 14 inches. Collected by R. MacFarlane.

Example No. 7474 is the model of a sled from Fort Anderson, Macenzie River district, built up on knees, similar to example No. 49111. Length, 12 inches. Collected by Robert MacFarlane.

The U. S. National Museum possesses a large number of full-sized specimens of the Canadian toboggan. A model of one of them from Anderson River, northern Canada, example No. 1976 in the U. S. National Museum (fig. 254) is made of two separate thin planks of birch wood not more than three eighths of an inch in thickness. These two planks are joined together pretty evenly at the inner edges and held in place by four battens in the upper side, three of them at equal distances along the flat surface, and a double batten holding the two ends together in front. These battens are firmly secured in place by a lashing of rawhide which passes over the batten through the boards. On the under side, the holes through which the rawhide passes are countersunk, so there is no danger of being injured by abrasion. These rawhide lashings are put on with great regularity, showing on the under

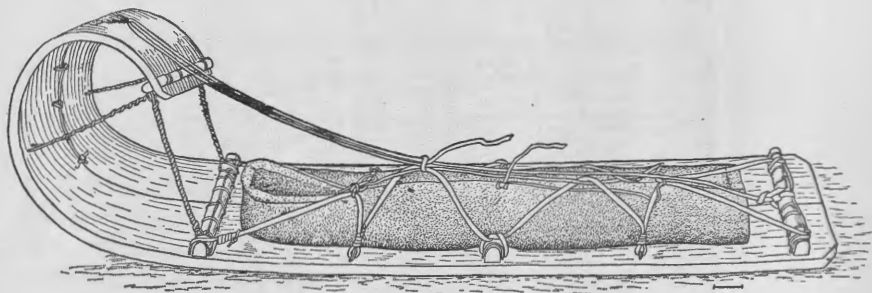


Fig. 254.

CANADIAN TOBOGGAN OR FREIGHT SLED.

Cat. No. 1976, U. S. N. M. Collected by R. MacFarlane.

side a pair of countersunk cavities on the boards so that every part is securely held in place where the most strength is needed. On the upper side the rawhide line shows an alternation of simple turns and marline hitches. The boards constituting the toboggan are curled up in front after the manner of an elegant sledge and sewed together with rawhide. This sewing is done in a very interesting manner. On the upper surface the holes appear some distance away from where the two margins are joined together, but on the underside they come out very near the margin so that they are bored out and unite along these edges. The front of the sled is braced by means of small cables of rawhide passing from the tip end to the planks below and to the first batten. There is also a strong rawhide line carried from the tip to the end of the last batten in the rear. This gives stability to the vehicle in every direction without increasing its weight.

Upon this model is lashed a long capsule or open bag of tawed reindeer hide bound around the edges and representing the cover or protection in which the pack or load is placed and held securely.

The knots on this model are mostly half or marline hitches alternating with round turns. Here and there, in fastening off the work (among the American aborigines), a square knot is found (which is somewhat unusual in this writer's experience), the Indians of this continent using the plan of merely taking in a loose end and relying upon the shrinkage of the rawhide to hold it in place. Length, 2 feet 4 inches. Collected by B. R. Ross.

Example No. 166974 in the U. S. National Museum (fig. 255) is a traveling sled from Canada. The apparatus is based on a toboggan made of short planks and crossbars. The front is covered with leather for ornamental purposes and the side and back are of moose skin set up on a frame of wood and iron painted red on the outside. The body or riding part extends backward to within 22 inches of the end, which is left free either for luggage or for the driver to stand on when he is riding. Rawhide lines or loops are attached to the side for the purpose of holding baggage or for the convenience of the driver. From the front to the rear extend doubled-braided lines a half inch wide, and the

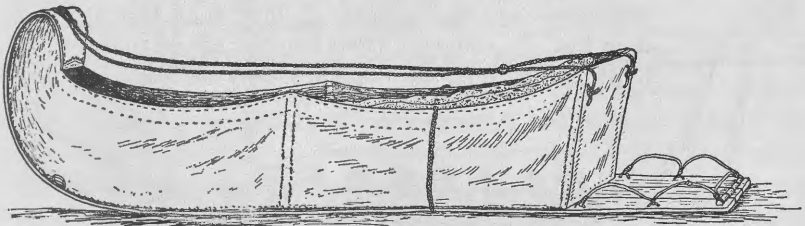


Fig. 255.

CANADIAN TRAVELING SLED, FULL-RIGGED.

Porcupine River, Alaska.

Cat. No. 166974, U. S. N. M. Collected by J. H. Turner.

interior is provided with a cover or boot of soft moose skin either for protecting the driver against the weather or for covering up the freight. Width, 14 inches; height of body, 18 inches. Collected by J. Henry Turner.

Dr. Rae tells us that the Boothians use sleds of rolled-up sealskin, not from choice but of necessity, because they have little or no wood, and no large bones of the walrus or whale with which to construct them, as the Arctic Highlanders have.¹

McClintock also says that the runners (or sides) of some old sleds left at Matty Island were very ingeniously formed out of rolls of sealskin, about $3\frac{1}{2}$ feet long, and flattened so as to be 2 or 3 inches wide and 5 inches high. The sealskins appeared to have been well soaked and then rolled up, flattened into the required form, and allowed to freeze. The underneath part was coated with a mixture of moss and ice laid smoothly on by hand before being allowed to freeze, the moss answer-

¹ "Eskimo Migration," Journ. Anthropol. Inst., London, 1878, VII, p. 129.

ing the purpose of hair in mortar to make the compound adhere more firmly.¹

The Pima Indians of Arizona are also said to make a wagon of hide for dragging their crops, and Peary relates that on one occasion he made a sled of musk-ox skin.

"It is easier," he says, "to haul 150 pounds on a sled than to carry 50 pounds on your back, particularly over the snow. The weight on the back sinks one down into the snow, while the sled is a much more easy process. For instance, on one occasion I hauled a sled carrying 60 or 70 pounds for 1,100 miles, and our average day's journey was 24 miles. The snow was in fairly good condition, and we came back well. If I had been carrying that weight, it would have been very difficult."

Petitot says of the Slave Indians about Fort Rae, Hudson Bay territory, that it is a singular spectacle to see a horde of these savages on their march over a frozen lake. As far as the eye could reach could be seen a long file of sleds and dogs, of women loaded with burdens and young children.²

The Western Déné travel in winter by means of light toboggans drawn by three or four dogs trotting in Indian file. In summer, when families are en route for their hunting grounds, the dogs are used for pack animals.³

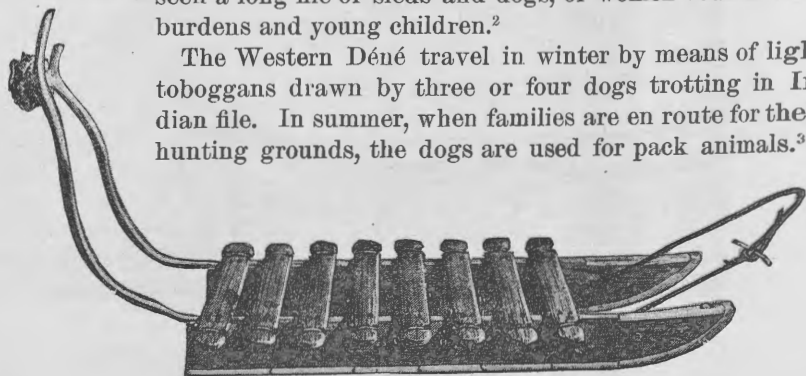


Fig. 256.

ESKIMO SLED (QAMUTING), FROM CUMBERLAND GULF.

From a figure in the Sixth Annual Report of the Bureau of Ethnology.

The sleds of the Chippewayan are formed of thin slips of board, turned up in front, and are highly polished with crooked knives in order that they slide along more smoothly. They are made of the red or swamp spruce-fir tree.⁴

Boas, from whom the following is taken, declares that during the greater part of the year the only passable road for the Central Eskimo is that afforded by the ice and snow; therefore sleds (qamuting) of different constructions are used in traveling.

The best model is made by the tribes of Hudson Strait and Davis Strait, for the driftwood which they can obtain in abundance admits the use of long wooden runners (fig. 256). Their sleds (Boas, fig. 482)

¹ McClintock's Narrative, etc., Boston, 1860, p. 233, with figure.

² Smithsonian Rep., 1865, p. 135.

³ Cf. Father Morice, Proc. Can. Inst. (Series 3), VII, p. 131.

⁴ Mackenzie, "Voyages, from Montreal through the Continent of North America," Philadelphia, 1802, p. 125.

have two runners, from 5 to 15 feet long and from 20 inches to $2\frac{1}{2}$ feet apart. They are connected by crossbars of wood or bone, and the back is formed by deer's antlers with the skull attached. The bottom of the runners (qamun) is curved at the head (uinirn) and cut off at right angles behind. It is shod with whale's bone, ivory, or the jawbones of a whale. In long sleds the shoeing (pirqang) is broadest near the head and narrowest behind. This device is very well adapted for sledding in soft snow; for, while the weight of the load is distributed over the entire length of the apparatus, the fore part, which is more apt to break through, has a broad face, which presses down the snow and enables the hind part to glide over it without sinking in too deeply.

The shoe (Boas, fig. 483) is either tied or riveted to the runner. If tied, the lashing passes through sunken drill holes to avoid any friction in moving over the snow. The right and left sides of a whale's jaw are frequently used for shoes, as they are of the proper size and permit the shoe to be of a single piece. Ivory is cut into flat pieces and riveted to the runner with long treenails. The points are frequently covered with bone on both the lower and upper sides, as they are easily injured by striking hard against hummocks or snowdrifts.

The crossbars (napun) project over the runners on each side and have notches which form a kind of neck. These necks serve to fasten the thongs when a load is lashed on the sledge. The bars are fastened to the runners by thongs which pass through two pairs of holes in the bars and through corresponding ones in the runners. If these fastenings should become loose they are tightened by winding a small thong around them and thus drawing the opposite parts of the thong tightly together. If this prove insufficient, a small wedge is driven between the thong and the runner.

The antlers attached to the back of the sled have the branches removed and the points slanted so as to fit to the runners. Only the brow antlers are left, the right one being cut down to about 3 inches in length, the left one to $1\frac{1}{2}$ inches. This back forms a very convenient handle for steering the sledge past hummocks or rocks, for drawing it back when the points have struck a snowdrift, etc. Besides, the lashing for holding the load is tied to the right-brow antler, and the snow knife and the harpoon are hung upon it.

Under the foremost crossbar a hole is drilled through each runner. A very stout thong (pitu) consisting of two separate parts passes through the holes and serves to fasten the dogs' traces to the sledge. A button at each end of this thong prevents it from slipping through the hole of the runner. The thong consists of two parts, the one ending in a loop, the other in a peculiar kind of clasp (partirang). Figure 484 (Boas) represents the form commonly used. The end of one part of the thong is fastened to the hole of the clasp, which, when closed, is stuck through the loop of the opposite end (see Boas, fig. 482). A more artistic design is shown in fig. 485 (Boas). One end of the line is tied to the hole on the

underside of this implement. When it is in use the loop of the **other** end is stuck through another hole in the center and hung over the **nozzle**. The whole represents the head of an animal with a gaping mouth. The dogs' traces are strung upon this line by means of an uqsirn (fig. 257), an ivory implement with a large and a small eyelet (Boas, fig. 486).

This whole account of the central Eskimo sled should be studied in the original memoir.

Other sleds are made of slabs of fresh-water ice, which are cut and allowed to freeze together, or of a large ice block hollowed out in the center. All these are clumsy and heavy, and much inferior to the large sled just described.¹

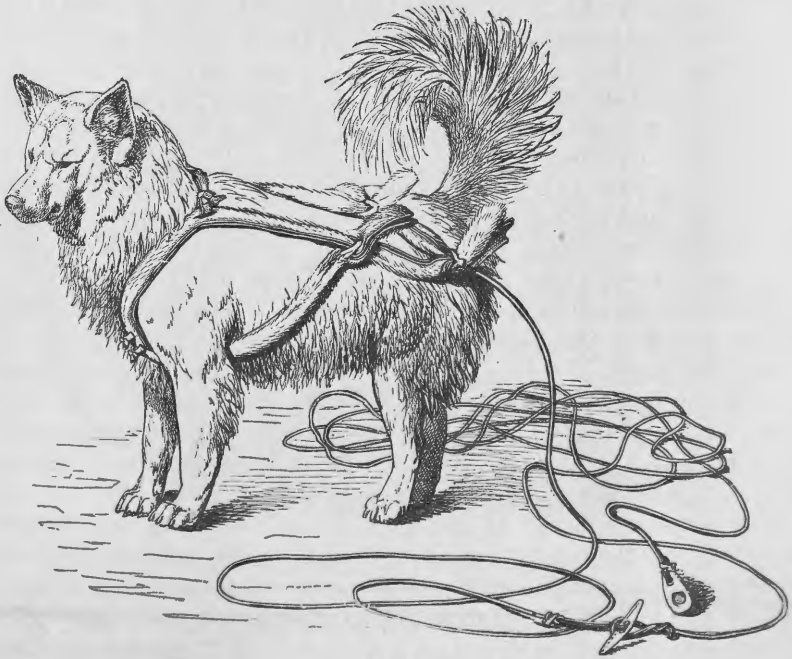


Fig. 257.

ESKIMO DOG HARNESSSED FOR SLED.

From a *specimen* in the Sixth Annual Report of the Bureau of Ethnology.

The inhabitants of Hudson Strait leave Tuniqten in the spring, arrive at the head of Frobisher Bay in the fall, and after the formation of the ice reach the Nugumiut settlements by means of sleds.²

The Eskimo sleds seen by Parry vary in size, being from 6½ to 9 feet in length, and from 18 inches to 2 feet in breadth. Some of those at Igloolik were of larger dimensions, one being 11 feet in length and weighing 268 pounds, and two or three others above 200 pounds. The runners are sometimes made of the jawbones of a whale, but more

¹ Sixth Ann. Rep. Bureau of Ethnology, pp. 529-538, figs. 482-489.

² *Ibid.*, p. 423.

commonly of several pieces of wood or bone, scarfed and lashed together, the interstices being filled, to make all smooth and firm, with moss stuffed in tight and then cemented by throwing water to freeze upon it. The lower part of the runner is shod with a plate of harder bone, coated with fresh-water ice to avoid wear and tear and to make it run smoothly. This coating is performed with a mixture of snow and fresh water about a half inch thick rubbed over it until it is smooth and hard upon the surface. When the ice is only in part worn off, it is renewed by taking some water in the mouth and spirting it over the former coating.

He noticed a sled which was curious on account of one of the runners and a part of the other being constructed without wood, iron, or bone of any kind. For this purpose a number of sealskins were rolled up and disposed into the required shape, and an outer coat of the same kind was sewed tightly around them. This formed the upper half of the runner, the lower part consisting entirely of moss, molded, while wet, into the proper form, and being left to freeze, adhering firmly together to the skins. The usual shoeing of smooth ice completed the runner, which for six months of the year is as hard as wood. The cross-pieces which form the bottom of the common sled were made of bone, wood, or anything they could muster. Over these was generally laid a sealskin as a flooring, and in the summer a pair of deer's horns are attached to the sled as a back, which are removed in winter to enable them when stopping to turn the sled up to prevent the dogs running away with it.

The whole is secured by lashings of thong, giving it a degree of strength combined with flexibility which no other mode of fastening could effect.¹

The sleds of Smith Sound were made up of small fragments of porous bone, admirably knit together by thongs of hide. The runners, which glistened like burnished steel, were of highly polished ivory obtained from the tusks of the walrus.²

Nowadays, says Bessels, the sled is the only means of conveyance used by the Eskimo of Smith Sound. Before they came in contact with the white man this was composed of pieces of bone ingeniously fastened together with thongs of rawhide, but now wood is frequently used.³

In the U. S. National Museum is a model of a sled from North Greenland, example No. 10418. The parts to be noticed on this sled are the runners, the ivory shoeing of the runners, the crosspieces or flooring, the braces and handles, and the method of lashing the different parts together. Owing to the great scarcity of material in this Eskimo region,

¹ William Edward Parry, "Second Voyage for the Discovery of a Northwest Passage," London, 1825, pp. 514-515.

² Kane, "Arctic Explorations," Philadelphia, 1, 1856, p. 205, with illustrations.

³ Bessels, *Am. Nat.*, 1881, p. 868, fig. 4. Also "Die Amerikanische Nord-pol Expedition," Leipzig, 1879, p. 359, with two excellent figures of old sleds.

most of their sleds as well as other apparatus are made of oak and other timber gathered from whaleships or wrecks.

The runners are each of a single piece of wood, straight along the top and pointed in front by a long curve. Through the runners holes are bored along the upper margin for the lashing of the crosspieces and the handles, and in the lower margin for lashing of the shoeing. Between these perforations and the part to be lashed the wood is cut away, so that the thong or other seizing is always countersunk and not exposed to be injured by abrasion of ice or snow. The shoeing is made up of pieces of ivory or bone fastened on by treenails at each end of the strips and firmly held to the runner by a series of lashings through countersunk holes. To effect this, first, a larger-sized hole is bored in a little way from the bottom; then two holes are bored from this point diagonally, one having an outlet on the inner margin of the runner, and the other just on the outer margin of the runner, to meet the two holes bored for this purpose through the runner itself. A coarse lashing of thong is then sewed through the hole and through the runner around and around until the hole is filled up and well bound together. To hold the floor pieces on top each bit of wood is cut away so as to leave only a narrow end; a hide thong is wrapped around these ends down through the hole in the runner from side to side, in the usual method of the Eskimo. Braces run from the front crosspiece out toward the front of the sled and are held in place by treenails and lashings of hide passing through holes bored in each. The handles are of the typical shape, and they also are sewed to the upper margin of the runner as described. A round piece of wood passes from handle to handle and is slightly let into each and held in place by a lashing of thong.

In a word, the parts of the sled are all sewed together in such manner as to take the strain in every direction, and not to expose the material to abrasion at any point. This model is a fair representation of all the sleds, small and great, from this region. Length of model, 14 inches. Collected by Dr. E. K. Kane.

The parts of sled (No. 2676) to be now studied are the runners, the shoeing, the crossbars, the handle, and the lashing. (Fig. 258.) The runners (as in the case of most from this region) are made of oak planks less than 1 inch thick, 4 inches high, and 2 feet 4 inches long, taken from whaleships. Evidently these runners have formed part of a sled prior to their use in this one, for there are a great many holes bored along the top and bottom which now have no function. Each runner is shod with strips of narwhal ivory. Holes are bored through the runners three-fourths of an inch from the bottom, and the wood is cut away between these holes and the bottom so that the rawhide lashing may be countersunk. The shoeing is fastened to the runners in the following manner: Holes half an inch apart are bored diagonally through the ivory so as to meet in a single countersunk cavity below. At every point of attachment there are two sets of these holes, one near the outer margin

of the shoeing, the other near the inner margin. The rawhide lashing passes through the runner, then down through one of the diagonal holes in the shoeing and up through the other, then through the runner to the inside, and down, and up through the diagonal bores in the shoeing back to the outside, as indicated in the drawing. The only exception to this method of attachment is where two ends of the shoeing come together. In that case the bore passes down through the shoeing a quarter of an inch from the end, and a slight gutter is cut from this perforation to the end of the ivory. When two pieces are bored and guttered in this way, a rawhide line passes down through one along to the other in the countersink; the lashing then passes up through the hole in the runner to the inside, and down through the other two perforations, backward and forward, until they are firmly sewed on and the rawhide is protected at every point. When the process is understood, the ingenuity of the Eskimo will appear, the object being at every step to secure the shoeing permanently in place and yet to protect the rawhide line from abrasion by the ice. There are five crossbars to the sled on which the load rests. They are made of the roughest kind of pine and oak from old box covers or barrels, and the

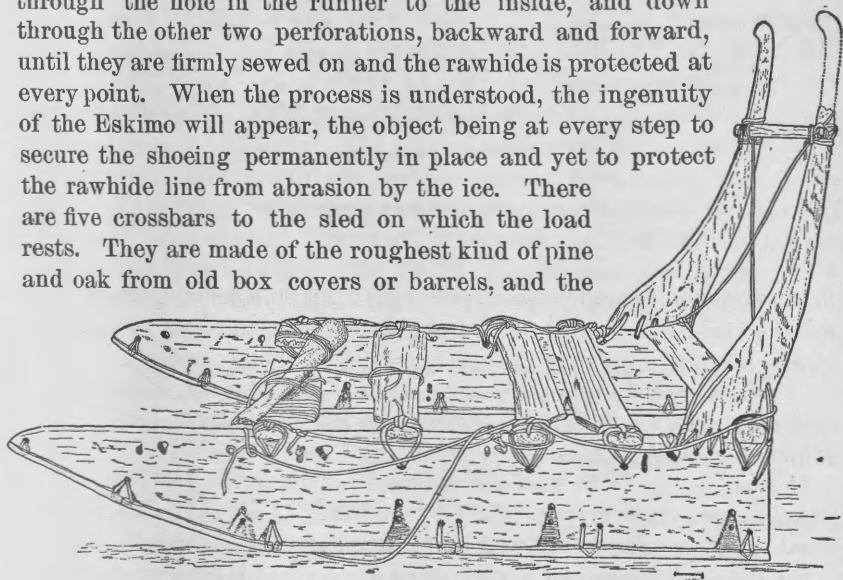


Fig. 258.

EASTERN ESKIMO SLED.

Cat. No. 2676, U. S. N. M. Collected by Dr. E. K. Kane.

front one has been mended by a splicing of bone, as there is no bracing whatever in the Greenland sled beneath. The lashing of these crossbars is very complete and efficient; holes are bored through the runners $1\frac{1}{2}$ inches from the top, just below where the crossbar is to be attached. The crossbars are cut away at the ends, so as to form a notch like a dovetail. A stout rawhide line passes over this notch and down through the runner to the inside, up over the notch and down to the hole in the runner, and back to the outside. These excursions through the runner and over the end of the crosspiece continue until the holes are filled up; the strands of the lashing are seized firmly by several turns of the rawhide line. In this particular case a half turn of the lashing passes also through old holes that were used when these runners were part of another sled.

The handles are very much like those of a plow. They fit on the top

of the runner at the hind end, and are held on by a rawhide line passing through a series of holes bored in the runner and in the handle. In addition to this, a rawhide line passes from a hole in the handle 2 inches above the runner to another hole in the heel of the sled. Two inches below its upper margin a rawhide line is rove four times through and fastened off by a half hitch; this part of the work is very neatly done. The upper part of the handles are joined together by a cross-piece, which is held on by a diagonal lashing.

The knots on this sled are very interesting, consisting of splices or whip knots (a very common device in all rawhide lines), overhand knots, and a series of half turns. After all, the most efficient knot is that shown

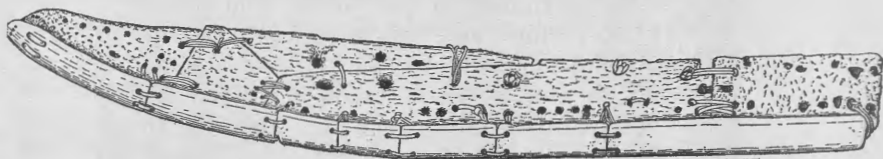


Fig. 259.

ESKIMO SLED-RUNNER MADE OF WHALEBONE.

Rennselaer Harbor, Greenland.

Cat. No. 10417, U. S. N. M. Collected by Dr. E. K. Kane.

in the attachment of the crosspieces to the runners, consisting of a seizing fastened off with a single half hitch; the side strand and fore-and-aft strand are taken up very effectively by this method of lashing.

In a land where there is no other mode of attachment, of course the sled maker has to rely upon his rawhide line to hold the parts of the vehicle together. Collected by Dr. E. K. Kane.

There is in the U. S. National Museum (example No. 10417, fig. 259), a sled runner made from sections of the bones of a whale, mitered and fitted together, and then sewed by lashings of rawhide lines.

The shoeing is made of seven strips of ivory and bone sewed on to the runner by means of a rawhide line passing through the runner and through the shoeing, the gutters being countersunk, so as to prevent the abrasion of the united material. Length, 25½ inches.

General Greely figures a modern Greenland low sled with crossbars and handles of wood, and by the side of it an old specimen with runners of driftwood shod with bone, three wooden crosspieces and handles of whale rib lashed on to the runners with thong and having a crossbar at the top.¹ The specimen is much dilapidated.

Example No. 89941, in the U. S. National Museum (fig. 260) is a sled from Labrador, consisting of three parts, the runners, the crosspieces, and the floor or bed. The runners are of wood, bent up slightly at the front. On the top of the runners, front and rear, jogs have been cut and perforated. On the top of these rest the crosspieces or sills, and above this three slats running longitudinally, one in the middle, and one at each side connected with the runner in front. The parts are

¹ "Lady Franklin Bay Expedition," I, pl. VI.

fastened together by lashing. Length, $9\frac{1}{2}$ inches. Collected by Lucien M. Turner.

The komatik, according to W. A. Stearns, is a sort of sled used by Indians of Bonne Esperance Island, and looks very much like a magnified specimen of one of those latter articles. Its dimensions vary from 9 to 13 feet in length, from 2 to 3 feet in width, and it stands about 8 inches from the ground. The wood is wholly pine, and the side bars are cut out of thin deal boards, planed down to about 1 or rarely 2 inches in thickness, with the front ends turned up like the front runner of a modern sled; the sides are often beveled, so that the bottom is one-fourth or one-half an inch wider than the top. The upper part of the sled is made of a number of thin pieces of wood of equal length and about 4 inches in width, with the ends rounded, and then notched—for a purpose that will appear hereafter. The front and rear pieces are similar, but of double the width, while the thickness of all is about the same, generally one-half an inch, though the end pieces are perhaps a little thicker. Each piece has two pairs of holes bored through it on either end, the distance between each pair of holes being that of the width of the top of the runner, and the distance between the holes of each pair being about half an inch. Between each pair the end is then gouged out crosswise about one-fourth of an inch deep, while the inner pair are connected at right angles by another gouge, the purpose of

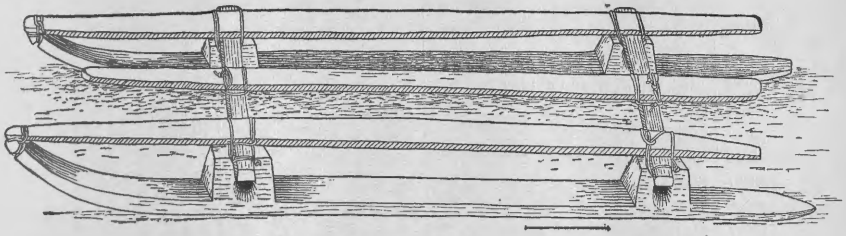


Fig. 260.

BUILT-UP SLED FROM LABRADOR.

Cat. No. 89941, U. S. N. M. Collected by Lucien M. Turner.

which will soon be seen. A curious fact is that all these holes are bored out with a red-hot iron, to make them smooth and even. On the side bars or runners, at a regular and previously measured distance apart, are bored holes to the exact number of the crossbars. The holes are bored one a little above and the next a little below the preceding one, so that when done the whole presents two unequal rows, hence the liability of splitting the soft pine in the sewing process is lessened. The next work is sewing the parts together. For this a coarse salmon net twine is threaded into a needle used for the purpose, and each crossbar is sewed to the corresponding holes in the runner, in and out of the holes on either side of the bar itself, and drawn as tight as possible;

the needle then slips under the twine through the groove across the inner pair of holes, and a loop and a stout pull fasten it; thus each bar is sewed on till all are tight. The forward end of each side bar must be strengthened by a long, thin iron placed lengthwise along the inner side of each bar and sewed tight to the boards.¹

The sleds of the Iroquois Indians, says Charlevoix, which serve to transport the baggage and in case of necessity the sick and wounded, are two small and very thin boards half a foot broad each and 6 or 7 feet long. The fore part is somewhat raised and the sides bordered with small bands, to which the thongs for binding whatever is laid on the carriage is fastened. Let these carriages be ever so much loaded, an Indian draws them without difficulty, by means of a long thong or strap, which is passed round his breast.

They use them likewise for carrying burdens, and mothers for carrying their children with their cradles; but in this case the thong or collar is placed upon their forehead, and not on the breast.²

The line between savagery and barbarism puts the wheel on the side of the latter. Barbarous man in traction should therefore form a later chapter, full of interest and necessary to the whole history of land transportation and travel. As late as 1878 the only railroad in China extended 10 miles from the Kaiping coal mines to the sea. The motive power was men, who worked twelve to fourteen hours and received 10 cents a day.

SLEDS IN THE U. S. NATIONAL MUSEUM.

Museum No.	Specimen.	Locality.	By whom contributed.
14800	Sled, reindeer, and driver	Norway	University of Christiania.
74534	Sled	Lapland	Centennial Commission.
2811	do	Kamchatka	Lieut. Wilkes, U. S. N.
73018	Sled, model	do	Dr. L. Stejneger.
46261	Sled runner, shoe of	Icy Cape	Dr. T. H. Bean.
63388-63389	Dog sled, model	St. Lawrence Island	E. W. Nelson.
15597	Sled, of whale bone, double	Poonook, Alaska	Henry W. Elliott
15609	Sled, wooden runners shod with whale's bone.	do	Do.
48104	Sled, model	Norton Bay, Alaska	E. W. Nelson.
129323	Sled (of wood)	St. Michaels, Alaska	L. M. Turner.
30771	Sled, model	Norton Sound, Alaska	Do.
48147	Sled (Ingalik)	Anvik, Alaska	E. W. Nelson.
168567	do	Togiak, Alaska	World's Columbian Exposition.
49111	Sled	Tanana River, Alaska	E. W. Nelson.
166974	do	Porcupine River, Alaska	J. H. Turner.
595	Babiche sled line (Dog Rib Indians)	Fort Simpson	B. R. Ross.
2042	Reindeer sled line	do	Do.
570	Dog sled (Chippewayan)	Slave Lake, Canada	Do.
1638	Sled (Eskimo)	Mackenzie River	R. MacFarlane.
10268	Sled runners (Eskimo)	Frobisher Bay	Capt. C. F. Hall.
10378	Sled runners and crossbar (Inuit).	Ross's ship, Victory, Repulse Bay.	Do.

¹ Stearns, "Labrador," Boston, 1884, pp. 145-146.

² Charlevoix, "Voyages to North America," 1, p. 336.

SLEDS IN THE U. S. NATIONAL MUSEUM—Continued.

Museum No.	Specimen.	Locality.	By whom contributed.
10419	Whale jawbone, used in making sleds.	Repulse Bay.....	Henry Grinnell.
10376	Sled, runner of.....	do.....	Capt. C. F. Hall.
12357	Sled runner (Eskimo).....	Polaris Bay.....	Dr. E. Bessels.
12363	do.....	do.....	Do.
89941	Sled (toy).....	Labrador.....	L. M. Turner.
90271	do.....	Ungava Bay, Labrador..	Do.
153511	Sled (Montagnais Indians).....	do.....	Henry G. Bryant.
531	Sled, reindeer.....	British Columbia.....	B. R. Ross.
1639	Sled (dog), Eskimo.....	Anderson River.....	R. MacFarlane.
2153	do.....	do.....	Do.
2676	Sled or traineau.....	do.....	Do.
7472	do.....	Fort Anderson.....	Do.
7473	Sleds (2).....	do.....	Do.
7474	Sled.....	do.....	Do.
532	Sled (dog), model.....	Fort Resolution.....	R. Kennicott.
1976	do.....	Slave Lake.....	B. R. Ross.
169044	Sled (Eskimo).....	Labrador.....	Henry G. Bryant.
561	Sled, boys', whalebone runners.....	Greenland.....	Dr. J. J. Hayes.
10377	Sled (Dr. Kane's).....	do.....	Henry Grinnell.
10418	Sled model (Dr. Kane's).....	do.....	Do.
127136	Sled, shod with iron.....	South Greenland.....	Mrs. Olivia Pavy.
168968	Sled.....	East Greenland.....	Dr. Sophus Müller.
127040	Sled, child's (model).....	Smith Sound.....	Dr. E. Bessels.
43920	Sled.....	Fort Yukon, Alaska.....	E. W. Nelson.
7970	do.....	Nushagak.....	T. T. Minor.
15593	Sled runners (2 ivory and 2 wood).....	Poonook, Bering Sea....	Henry W. Elliott.
15613	Sled, shod with whalebone.....	do.....	Do.
15597	Double sled, whale rib.....	do.....	Do.
56889	Sled, Eskimo.....	do.....	Chas. L. McKay.
63387	Sled (dog).....	do.....	E. W. Nelson.
153653	Sled (model).....	do.....	J. H. Turner.
153654-153655	Sled (dog team), model.....	do.....	Do.
38793	Sled (model).....	St. Michaels, Alaska....	E. W. Nelson.

ROADS AND TRAVELERS' CONVENIENCES.

To this vast subject of going about afoot and riding, of carrying singly and cooperatively, and of shifting the burden upon the backs of beasts, there are subsidiary conveniences of great importance, such as the following, including all activities covered by classes 4 and 5, mentioned on page 254.

1. Roads and bridges, involving the entire subject of primitive engineering.

2. Provisions for extending the length of the journey and the time that may be spent away from home.

3. Condensed and special food for long trips, and travelers' drugs.

4. Natural, artificial, and human guides.

5. Provisions for camping, resting, relaying, sleeping, feeding animals, etc.

6. Signaling, postal service, and couriers.

7. Measures of time and distance, clocks, calendars, stations, milestones, length of journey and extent of commerce, etc.

8. Apparatus of trade, money.

9. Markets, bazaars, and fairs.

10. Amnesty and laws of travel and trade. The social organizations, laws, and customs involved in and created by this vast industry.

None of these topics can be fully elaborated here. Some of them will be considered and illustrated from material in the Museum later.

1. *Roads and bridges.*—The U. S. National Museum has among its treasures a collection of primitive bridges, to be used in illustrating the history of that series of inventions which led up to the modern roadbed and railroad. The earliest roadmakers were not engaged in casting up highways, but in keeping them clear. The most primitive bridges were logs or great rocks across streams, and, after that, bridges supported on trees, posts, vines, and braces, anticipating in a rude way the pier bridge, the suspension bridge, and the cantilever. Fords and portages were a part of this activity.

Mankind had walked over every habitable part of the globe before there was a beast of burden. The trails laid down by ruminants were adopted by man until the earth was a network of primitive roads.

“Locomotion among the Western Déné,” says Morice, “is ordinarily by walking in very narrow paths, though the Tsil-koh-tin and Southern Carriers now travel on horseback. More commonly the Carriers use as highways the numerous lakes that dot the country in summer and winter.”¹

The obstacles in the way of early travel and the indefatigable energy of men in passing over them are well set forth in Mrs. Bishop’s travels among the western Tibetans. The following elements of difficult primitive travel are mentioned about the Shayok River:

Winter traffic along river beds nearly dry.

Summer caravans laboring along difficult tracks at great heights.

Climbing difficult rock ladders and perilous stairways.

Crossing glaciers filled with yawning crevasses.

Riding along precipice ledges on the yak.

Leading baggage horses down precipices, with men holding the head and tail of each.

Travelers and goods making perilous runs in scows, poled and paddled.

Swimming the animals through the cold water.

“We had,” writes Mrs. Bishop, “twelve horses, all led. ‘Water guides’ with 10-foot poles sounded the rivers ahead; one led Mr. Red-slob’s horse in front of mine with a large rope, and two more led mine, while the gopas of three villages and the zemindár steadied my horse against the stream. * * * All the chupas went up and down sound-

¹ A. G. Morice, Proc. Canadian, Inst. (Series 3), VII, p. 131.

ing long before they found a possible passage. All loads were raised higher, the men roped their soaked clothing on their shoulders, water was dashed at our faces, and then with shouts the whole caravan plunged into deep water, strong and almost ice cold. The traveler from Kashmir to Tibet can not be borne in a carriage or a hill cart. Much of the way he is limited to a foot path, and walks down all rugged and deep descents and dismounts at most bridges. The roads are bridle paths, worn by traffic alone across the gravelly valleys, but elsewhere constructed with great toil and expense, along narrow valleys, ravines, gorges, and chasms. For miles at a time this road has been blasted out of precipices from 1,000 to 3,000 feet in depth, and is merely a ledge above a raging torrent, the worst parts, chiefly those around rocky projections, being scaffolded, i. e., poles are lodged horizontally among the crevices of the cliff, and the roadway of slabs, planks, and brushwood or branches and sods is laid loosely upon them. This track is always wide enough for a loaded beast, but in many places, when two caravans meet, the animals of one must give way and scramble up the mountain side."¹

In a subsequent paper trails, roads, portages, and bridges, especially of aboriginal America, will be more fully treated.

2. *Increasing the length and the time of journeys.*—There are many regions of the earth that were positively inaccessible to primitive man; but there are also vast tracts that, while they are uninhabitable, are yet accessible and may be crossed. A part of the history of travel relates to invading and traversing these spaces. If there had been no such intervals, there would have been little travel. As we have a modulus of early culture in the depths at which people might operate in the earth or in the sea, so we have another in the length of journeys and the number of months or years that would be devoted to a single round or excursion in walking, packing, boating, sledging, or with flocks and herds. These distances in modern commerce constitute the haul between producer and consumer.

Birds of passage made formerly longer journeys than men, and the length of their migrations in time and distance was equaled, perhaps, by those of fishes and marine mammals. The motives which governed the movements of these creatures were very simple, but these same constituted the incentive to human movements over the earth. The coming and going of birds and marine creatures are likewise the occasion of an enormous amount of human bustle and running about. Most of the domestication of animals is caused by a desire to have them at our doors, and to make us independent of their migrations.

In addition to the great migrations of aerial and marine creatures, many land animals were often obliged by natural conditions to travel great distances; and the inquiry is also concerning the self-imposed

¹ Mrs. Bishop, "Among the Tibetans," Chicago, 1894, pp. 36, 76.

loads of men and the distances to which they bore them in order to follow the caribou, the buffalo, the elephant, etc., for the purpose of living upon them.

All of these combine to give confidence to men, to enlarge their cosmogony and to stimulate the cooperative activities which make it possible to go away farther and return.

In every tribe there are stories of travelers who have made long voyages and returned. Dr. Boas says that the myths of the northwest coast of America point across the Pacific; all of them are *Odysseys*. Besides that class of traditions which fix upon the present habitat as the primal home, there is another class of migration myths. One school of interpretation may appreciate and another depreciate the real length of the migration. That is not mooted here. They are migration myths, and relate to wanderings.

The U. S. National Museum comes in contact with such by its collections of mythological material—carvings, totem posts, paintings, marks on pottery, masks, dress, figures on boats, paddles, carrying baskets, and even in the stitch or mesh in weaving. The length of a sled or of a boat, the number of parts to a dog harness, the existence of certain kinds of packing cases, the calendar, and many other objects which the curator has to handle every day, are in fact metric apparatus to indicate how far away the owners are bold enough to go.

Again, the perfecting of devices prolongs the day's travel. Nansen tells of a kaiak journey of 80 miles in a single day, and Schwatka said in a lecture that he had made over a hundred miles in one continuous excursion with a company of Eskimo.¹

The East Greenlanders journey around to West Greenland to get snuff, and will consume four years in a single excursion there and back. Nansen says that they often remain no longer than an hour at the trading station and then take up their homeward march.

The Manchu and Manyarg who navigate the Sungari are said to spend eight days from the mouth of the river to Sansin; and the voyage to Tsitsikar or Mergen requires a month. They either tow their boats from the land or push them along with long poles.²

The Tuski, near East Cape, undertake journeys to Kolima occupying six months, and to other points requiring four months.³ Wrangell supposed that some men passed their lives thus, but Hooper does not seem to be of this opinion. The journeys are undertaken with reindeer and large covered sleds. Furs and ivory are taken to be exchanged for tobacco, beads, knives, prints, sugar, spirits, etc.⁴

Formerly, says Seton-Karr, the different tribes of northwest British Columbia were afraid to quit their tribal territory, but now Indians

¹ F. Nansen, "The First Crossing of Greenland," London, 1, p. 367; II, p. 436.

² Ravenstein, "Russians on the Amur," London, 1861, p. 261.

³ Hooper, "Tents of the Tuski," London, 1853, p. 185.

⁴ *Ibid.*, p. 186.

can be found willing to accompany the white man through regions that are as strange and unknown to them as to him. Some, for instance, have accompanied miners as far as the mouth of the Yukon, and returned home by way of San Francisco.¹

The extent and direction of aboriginal journeys and commerce have been in one place cut off, in another greatly stimulated, by contact with the Caucasian race. Certainly in Canada the fur-bearing animals were soon killed about the trading establishments, and the Indians were stimulated to make greater and greater excursions into the wilderness and from the wilderness to the trading posts.²

3. *Travelers' food and drugs.*—Condensed food and stimulants are necessary to a long journey, and the invention of them has incited much ingenuity. So frozen food in the north is succeeded by pemmican and this by meal, cassava, taro, tsamba, or what not, in order that a great deal could be put into a small space.

The U. S. National Museum has made a large collection of this packed and condensed travelers' food, and among the specimens illustrating early medicine are many of the strength-sustaining drugs among savages.³

The Indians of southern Yucatan, according to Morelet, never set out on any expedition without a supply of *pozol*. This is maize made into a kind of paste, sweetened with sugar to suit the taste, and when mixed with water serves at once for food and drink. It is at the same time the most economical and portable kind of provision for a journey.⁴

Chocolate, says Humboldt, is easily conveyed and readily employed. As an aliment it contains a large quantity of nutritive and stimulating particles in a small compass. It has been said with truth that, in the East, rice, gum, and ghee (clarified butter) assist man in crossing the deserts; and so, in the New World, chocolate and flour of maize have rendered accessible to the traveler the table-lands of the Andes and vast uninhabited forests.⁵

4. *Guides, natural and human.*—Nowadays the steel rail holds the vehicle smoothly and directly to its course, and on the waters artificial buoys, light-houses, and apparatus for observing the heavenly bodies and for steering do almost as well for the ship.

Primitive men were not without their folk astronomy, instincts, natural pilots, and experiences. They also knew how to keep the traveler or the boat on a direct way. Winds blow, waters run, natural objects animate and inanimate on which man depends move and have their areas of dispersion.

¹ H. W. Seton-Karr, Proc. Roy. Geog. Soc., London, 1891, XIII, p. 73.

² Mackenzie, "Voyages from Montreal through the Continent of North America," Philadelphia, 1802, p. i. On lengthening the journey, consult also W. C. Bompas, "Northern Lights on the Bible," London, 1894, pp. 63-68.

³ Cf. Index-Catalogue Surg. General's Library, Washington, s. v.

⁴ Morelet, "Travels in Yucatan," New York, 1871, p. 65.

⁵ Bohn, "Travels to the Equinoctial Regions of America," London, 1852, II, p. 59.

It has been said that the islanders of the Pacific wandered *after all* automatically about and settled their archipelagos.¹

Above this unconscious guidance there is an accumulation of *folklore* and folk experiences in all savages that are truly the marvel of all intelligent travelers.

Moreover, there is a sign language of travel. The Africans had *one* system, the Americans another. It is an interesting group in the U. S. National Museum, merging on one side into music, on the *other* into the apparatus of war.

Early in September, 1513, says Helps, Vasco Nunez set out on his renowned expedition for finding the "other sea," accompanied by 190 men well armed, and by dogs, which were of more avail than men, and by Indian slaves to carry the burdens. He went by sea to the territory of his father-in-law, King Careta, by whom he was well received, and accompanied by whose Indians he moved on into Poncha's territory. This cacique took flight, as he had done before, seeking refuge among his mountains; but Vasco Nunez, whose first thought in his present undertaking was discovery, not conquest, sent messengers to Poncha, promising not to injure him. The Indian chief listened to these overtures and came to Vasco Nunez with gold in his hands. He did no harm to Poncha, and, on the contrary, secured his friendship by presenting him with looking-glasses, hatchets, and hawks' bells, in return for which he obtained guides and porters from among this cacique's people, and was enabled to prosecute his journey.

Following Poncha's guides, Vasco Nunez and his men commenced the ascent of the mountains until he entered the country of an Indian chief called Quarequa, whom they found fully prepared to resist them.²

Balboa on arriving at the coast of the Pacific in 1543 "seems to have heard of a wealthy tribe who lived on the seacoast far to the south and used large sheep as beasts of burden."³ * * * The supposition that accounts of Peru had reached the Isthmus, notwithstanding the great distance, involves nothing impossible."

Quite as much as shepherds watching their flocks, travelers and carriers have watched the stars, mapped out the heavens, and guided their way on land and water by the celestial lanterns.

The Eskimo in traveling use the north star as a guide. Their knowledge of seasons is also wonderful. The seasons have distinctive names, and these are divided into a great number, of which there are more during the warm weather than during the winter.⁴

Roger Williams says, "The wilderness being so vast, it is a mercy, that for a hire a Man shall never want guides, who will carry provisions

¹"Die unfreiwillige Wanderungen im Stillen Ozean," Petermann's Mittheilungen, 1894.

²Helps, "The Spanish Conquest in America," New York, 1856, I, p. 340.

³Bandelier, "The Gilded Man," New York, 1893, p. 5, quoting Herrera, Dec. I, Lib. x, Cap. III.

⁴Lucien Turner, Eleventh Ann. Rep. Bureau of Ethnology, p. 202.

and such as hire them over Rivers and Brookes, and find out oftentimes hunting houses or other lodgings at night.

"I have heard of many English lost and have oft been lost my selfe, and my selfe and others have been often found and succoured by the Indians.¹ * * *

"They are so excellently skilled in all the bowels of the Country (by reason of their hunting) that I have often been guided twentie, thirtie, yea, sometimes forty miles through the woods a streight course, out of my path."

5. *Provisions for camping on the road.*—Lengthening a journey beyond the endurance of a single effort involves the putting down of the load and resting. The steps in the progress of invention leading up to the resting and relaying elements of many modern cities seem to have been—

1. Modifying the packing apparatus so that it could be laid aside and resumed with least effort.

2. Carrying the means of providing temporary bed, shelter, fire, food, and defense.

3. On the establishment of regular trails, temporary shelters were provided, which the traveler might use and proceed. No attendants were needed.

4. Caravansaries, where for a fee the traveler and porter might sleep and be fed, and where his commodities could be safely housed from thieves.

5. Hostelries, villages, repair shops, stores—in short, the setting up of a travel center.

Aboriginal hospitality had its first motive largely in the traveling industry, and its abolition was caused by the superabundance of travel causing the existence of hostelries and guilds relating thereto, creating a public sentiment against receiving strangers free of charge.

The methods adopted by the Central American Indians when preparing to pass the night upon an open savanna were instructive. In the first instance they placed upon the ground a quantity of broad dry leaves to protect them from the damp grass. They then dispersed, and in a few minutes the adjacent forest resounded with the noise of the blows made by their machetes. They returned bearing loads of firewood and also several strong forked branches. These they sharpened at one end and fixed into the earth near the camping place to form supports to carry the bales of tobacco. In this manner the cargo was raised about 3 feet, and thus they carried out the invariable rule of the Indians, who never leave anything upon the ground at night. They then lighted a large fire.² The tambo of Peru was a hut of refuge along the public trails and highways across the despoblado or desert regions.

¹ Roger Williams, *Coll. R. I. Hist. Soc.*, I, p. 72, with vocabulary for guide, hire, etc., with derivatives.

² Brine, "The American Indians, Their Earthworks and Temples," London, 1849, pp. 291-292.

Mr. im Thurn speaks of the Indians who accompanied him in *Guiana* as lying in hammocks under which fires were lighted. But they also compelled the boys to take lighted palm leaves and singe them as they lay in their hammocks to destroy savage insects.¹

6. *Signals, couriers, and posts.*—The U. S. National Museum has an interesting collection relating to conveying information for and by travel. The emergencies of the growing state, as in Peru, demanded that the central power should be more rapidly informed. The separate elements in the problem before the early man were the following:

1. To substitute for the long walk a succession of quick runs—couriers.

2. To have trained professionals with road conveniences and guard—posts.

3. To have an esoteric sign language to the eye and to the ear, by which information may be conveyed to the traveler as he goes along, by which one traveler may leave word for another or, finally, to get rid of the traveler altogether by a system of telephoning or of visible speech.

Langsdorff mentions the use of fire signals in Japan. "In defiance of the interdict the fishermen informed us that four days before intelligence was communicated to Nagasaki by fires in the night of a three-masted vessel being off the coast; that at our appearance off the harbor information of it was conveyed by a post of observation upon the nearest hill."²

"The Micmacs have a system of communicating while in the woods. Sticks are placed in the ground; a cut on one of them indicates that a message in picture writing on a piece of bark is hidden near by under a stone. The direction in which the stick leans from its base upward indicates that in which the party moved, and thus serves as a convenient hint to those who follow to keep off their hunting ground."³

The method of the Karankawa of communicating with each other when parties were at a distance was by smoke. By some means known only to themselves, and carefully kept secret, the smoke of a small fire could be made to ascend in many different ways, as intelligible as spoken language to them. At night the horizon was often dotted in various directions with these little fires, and the messages thus conveyed seemed to govern the movements of the Indians.⁴

Das Ausland for February, 1889, et seq., has a very interesting article by Robert Muller on "Life and Occupation in the Cameroon," in which a curious instrument is thus described: A log is hollowed out and is divided along the transverse diameter by a bridge, upon which a drumstick is beaten to produce sounds of different tones. This rather unpromising instrument becomes of great importance as

¹"Indians of British Guiana," London, 1883, p. 12.

²Langsdorff, "Voyages and Travels," London, 1813, I, p. 220.

³S. Hager, Am. Anthropologist, Washington, 1895, VIII, p. 31.

⁴Gatschet, "The Karankawa Indians," Cambridge, 1891, p. 19.

a means of communication and may, in fact, be called a "drum telegraph." The villages are situated comparatively close together, and by means of the drum news is communicated rapidly from one village to another. A regular drum language has been invented, and this can be imitated with the mouth or beaten on the breast, so that conversation can be carried on by the natives in the presence of white men without the latter understanding it, though comprehending the spoken language. The drum also serves the ordinary purpose of an instrument to dance by, etc.¹

The Jivaros practice a system of telephony, which has at all times been very dangerous to their adversaries in war, by giving strokes on the "tunduli," a large drum, which is heard from house to house and passed on from hill to hill. The houses are all over their territories at convenient distance for the purpose; and in this manner very varied information is conveyed in a few moments to all the families of hordes dispersed over a large extent of country. This was the greatest danger the Spaniards had to contend with, and is still a main source of protection to these Indians, as they can rouse a large number at a moment's notice and sound the alarm through entire hordes.²

The messenger, mail carrier, dispatch bearer, professional courier, is equipped and exercised after the manner of the traveler. Altogether these men are a device like a machine, transforming numbers of men into velocity.

To develop an extensive system of couriers in ancient times, extended territory and a strong central government were needed. Hence the Greeks, having a small territory and disunited states, were not moved to establish any such institution.

In very early times among the Egyptians there were provisions for the conveyance of letters; but their system of rapid communication, if they had any, is not revealed.

Rome, on the other hand, and especially under the Empire, had, as will be seen, roads through all the territories they conquered. Besides the marching of armies over them and the general traffic, these roads were the means of continuous and rapid intelligence.

Among the Italian allies of Rome, officials on public business imposed any conditions they chose on the people along their way, such as furnishing food, lodging, fresh beasts, and even transport. Senators or ministers carried a mandate to subjects and allies to supply them with all necessaries for the journey. For the purposes of dispatches there were a variety of men and methods. These are well worked out in Smith's Dictionary of Greek and Roman Antiquities, third edition, under the phrase *cursus publicus*. Such terms as couriers, messengers, mounted couriers, stations, or relays (*mutationes*), postal stations (*mansiones*), conductors, guards, drivers, beasts of burden or conveyance,

¹H. W. Henshaw, *Am. Anthropologist*, III, p. 292.

²A. Simson, *Journ. Anthropol. Inst.*, 1880, May, p. 387.

rolling stock, passports, smack of the road and great movements of people and money and goods. We read that the communities were bound to furnish and maintain the teams and to keep the stables in repair. They had further to secure the services of muleteers, mule doctors, wheelwrights, grooms, and conductors (*vehicularii*). To organize and to keep moving such complicated machinery required excellent management and training. From such a well-defined system backward to more primitive methods constitutes the early history of culture in this regard.¹

The Persian Empire under Darius, son of Hystaspes, affords the earliest instance of a national postal service. Mention is made of a class called symmaci as existing in the most ancient times among the Egyptians for the conveyance of letters by land.² In Persia horsemen stationed at intervals, and relieving one another, conveyed the imperial will in all directions from Susa, Ecbatana, or Babylon.

"The post is carried by Lapps and reindeer overland in Finmarlân from Alten to Vadsö, Kautokeenö, Karasjok, and other points in the Arctic, and it rarely fails to arrive on schedule time."³

Langsdorff thus speaks of travel in America at the beginning of the century. In consequence of an entire failure of communication by water, that by land exceeds what anyone could expect. Posts go regularly from Vera Cruz to all the provinces of North and South America. A courier comes in about two months from Mexico to San Francisco, the farthest establishment to the north. It commonly brings the news from Europe of about six months back. From San Francisco anyone may travel with the greatest safety, even to Chile; there are stations all the way kept by soldiers.⁴

On the lofty plateau of Vilque, between Puno and La Paz, says Wiener, there are regular couriers. The master of the post has in his stable several mules and in his service chasqui who are accompanied by their women. This service is well done. At 2 kilometers from the station the courier sounds on his horn, and beasts are put in the post road to be ready when the chasqui arrives. Only half an hour is lost at the station.⁵

7. *Metrical appliances.*—In many places and ways transportation has been a promoter of invention for metrical appliances. The pack load of a man is a unit of weight in Africa and America. Layard says that wheat and barley in Armenia are sold by the camel load, nearly 480 pounds. It is said that Charles V amused himself with clocks when

¹ Beare, in Smith's Dictionary of Greek and Roman Antiquities, s. v. *Vehicularii Cursus Publicus*.

² Ibid.

³ Rasmus B. Anderson, Senate Ex. Doc. No. 73, Fifty-third Congress, second session, p. 148.

⁴ Langsdorff, "Voyages and Travels," London, 1814, II. p. 207.

⁵ Wiener, "Pérou et Bolivie," p. 392. On the whole subject of signals, cf. Mallory, Fourth Ann. Rep. Bureau of Ethnology.

his mind became enfeebled. But some one remarks that his study of clocks was a profound appreciation on his part of the fact that his ships could go no farther until his clocks ran better.

Almanacs or records of the days of the year and clocks or artificial devices for recording time of day must necessarily have occurred to those who had to get about more forcibly than to those who stayed at home. Indeed, antedating the invention of weights and measures was the art of counting, or simple arithmetic. The systems of counting were greatly improved by the art of transportation. The thousands of tally clerks on the docks belong to an old race, older than their demure prototypes on Egyptian monuments keeping the tale of bricks.

Vaca says that the Indians of a tribe he visited gave him "2,000 back loads of corn." The back load was therefore the unit of measure.¹

"They are punctuall in measuring their Day by the Sunne, and their Night by the Moon and the Starres, and their lying much abroad in the ayre; and so living in the open fields, occasioneth even the youngest among them to be very observant of those heavenly lights."²

While exchange and all its mechanism constitute a separate body of industry, it can not be denied that weights and measures set agoing a large fraction of these activities. Before things can be bartered, some one must go and get them for that purpose; he must bear them to and fro or to stated meeting places, and arrive on time. Commerce instigates very largely the ransacking of the earth and the manufacture of her raw materials. All these, as well as barter at every point, regulated most of the travel and carrying, by perfecting clocks and calendars.

The early conquests of the Assyrians in India had enabled the Indians to carry on a great trade in ivory, and from them the Tyrians drew their ivory for the great throne of Solomon. "The men of Dedan were thy merchants, they brought thee for a present horns of ivory and ebony" (Ezekiel, xxviii, 15; Isaiah, xxi, 13).³

The inhabitants of the settlements about the mouth of the Anadyr divide their time in summer between fishing and hunting the wild reindeer, which make annual migrations across the river in immense herds. In winter they are generally absent with their sledges, visiting and trading with the wandering Chukchi going with merchandise to the great annual fair at Kolima.⁴ The reindeer is their calendar.

The Giliak of the Tymy collect immense stores of frozen fish, not only as food for themselves and their dogs during winter, but also as an object of trade with the Aino, Orochon, and Giliak of the coast and mainland, and the Mangun of the Amur. The Aino bring to the valley of the Tymy at stated seasons Japanese goods, the Orochon furs, the others copper, seals, Russian and Manchu merchandise.⁵

¹ Davis, "Spanish Conquest of New Mexico," p. 105.

² Roger Williams, Coll. R. I. Hist. Soc., I, p. 67.

³ Hart, "Animals of the Bible," London, 1888, p. 91.

⁴ Kennan, "Tent Life in Siberia," p. 288.

⁵ Ravenstein, "Russians on the Amur," London, 1861, p. 271.

Hooper says that the Tuski exchange skins of the reindeer and a small portion of the meat for sealskins, whale, walrus and seal's flesh, tusks, sinews, etc., all of which are much less valuable than their own commodities. Sealskins they need for marine employments, as those of the reindeer are destroyed by salt water; the aliens require deerskins for hut furniture.¹

A company of hunters in 1646 sailed down the Kolima River to the Polar Sea. East of the Kolima they fell in with the Chukchi, with whom they dealt in this way: They laid down their goods on the beach and then retired, on which the Chukchi came thither, took the goods, and laid furs, walrus tusks, or carvings in walrus ivory, in their place.

Herodotus already states in Book IV, chapter 196, that the Carthaginians bartered goods in the same way with a tribe living on the coast of Africa, beyond the gates of Hercules. The same mode of barter or commerce by deposit was still in use nearly two thousand years later, when the west coast of Africa was visited by the Venetian, Cadamosto, in 1454.²

Hooper saw in the hands of an Eskimo at Barter Island an example of the knife called "dague," obtained from Hudson Bay Company's Indians.³

Since the beginning of our century European fleets have visited the west shore of Baffin Bay and Davis Strait, and thus manufactures from that country have found their way to the inhospitable shores of the Arctic Sea. The most valuable articles which were bartered were metals and wood. The value of the former may be seen in its economical application for knives and harpoon heads.⁴

The ordinary trade of the Eskimo is purely primitive, people going to the sources to procure the commodity. But Murdoch tells of a company of more southern natives who brought a boat load of skins of the bearded seal to Point Barrow for sale, to be used to cover Umiaks.⁵

The very simplest form of commerce on the western continent does not seem to have been in the hands of peddlers; but certain necessary articles like salt and other minerals existed in mines or quarries situated inside the boundaries of certain tribes. The owner did not dig the material and carry it about to sell or exchange it, but the people who wanted the article had to go after it and pay some kind of tribute for the privilege. Thus, the Tanos held the veins of turquoise or kalaite at Cerillos. The Teguas, Piros, and Zuñis were settled near salt marshes. The Queres of San Felipe had in front of their village large veins of mineral paint, for adorning pottery.

According to Bandelier, in 1540, the Pecos Indians came to Zuñi

¹Hooper, "Tents of the Tuski," London, 1853, p. 35.

²Ramusio, "Navigazioni et Viaggi," I, 1588, leaf 100; Nordenskiöld, "Voyage of the Vega," New York, 1882, p. 453.

³"Tents of the Tuski," London, 1853, p. 257.

⁴Sixth Ann. Rep. Bureau of Ethnology, p. 466.

⁵Ninth Ann. Rep. Bureau of Ethnology, pp. 44-55.

with buffalo hides. The people of Acoma exchanged cotton mantles against deerskin with the Navajo; the Utes traded at Taos; the Apaches of the Plains came to Pecos with buffalo robes. The Pecos people did not allow the Apache to enter their village. They even kept a watch with trumpets.¹

The Wyandots bartered the surplus of their maize fields to surrounding tribes, receiving fish in exchange. The Jesuits styled their country (Lower Canada) the granary of the Algonquian.²

As evidence of traffic in the mound-building period, Professor Putnam instances finding obsidian knives. Now this material belongs stratigraphically in the Yellowstone Park or in the Colorado Valley or in Mexico. He found also mica from North Carolina, gold, silver, meteoric iron, alligator's teeth, and shells from the Gulf of Mexico.

The trade between Ottawa River and Hudson Bay is mentioned by the Jesuits.³

"Among themselves they trade their Corne, Skins, Coates, Venison, Fish, and sometimes come ten or twenty in a company to trade amongst the English. They have some who follow onely making of Bowes, some Arrowes, some Dishes (the women make all their Earthen vessells) some follow fishing, some hunting, most on the seaside make money and Store up shells in Summer against Winter whereof to make money."⁴

Breckenridge remarks that the Louisiana nations have considerable trade or traffic with each other. The Sioux have for this purpose regular fairs or assemblages at stated periods. The same thing prevails with the nations on the southwest side of the Missouri. Those toward the south have generally vast numbers of horses, mules, and asses, which they obtain in trade, or war, from the Spaniards or nations immediately bordering on New Mexico. These animals are chiefly transferred to the nations northeast of the river by such of the southern tribes as happen to be on good terms with them, who obtain in exchange European articles, procured from the British traders. Their stock of horses requires to be constantly renewed by thefts or purchases. From the severity of the climate and the little care taken of the foals, the animal would otherwise be in danger of becoming extinct. Their mode of trading with each other is perfectly primitive. There is no bargaining or dispute about price. A nation or tribe comes to a village, encamps near it, and, after demonstrations of a thousand barbarous civilities on both sides, as sincere as those which are the result of refinement, one of the parties makes a general present of all such articles as it can con-

¹ *Archæol. Inst. Am. (Am. Series)*, III, 1890, p. 164, quoting Espejo and Castañeda.

² Parkman, "History of the Conspiracy of Pontiac," etc., Boston, 1891, I, p. 23, referring to Mercier, "Relation des Hurons," 1637, p. 171. Also F. J. Turner, Johns Hopkins University Studies in Historical and Political Science, Series 9, Nos. XI-XII.

³ "Relations des Jesuites," 1640, Tome I, 34. "Ceux-cy ont au Nord les Timiscimi, les Outimagami, les Onachegami, les Mitchitamou, les Outurbi, les Kiristinon qui habitent sur les riuves de la mer du Nord où les Nipisiriniens vont en marchandise."

⁴ Roger Williams, *Coll. R. I. Hist. Soc.*, I, p. 133.

veniently spare. The other a short time after makes in return a similar present. The fair is then concluded by a variety of games, sports, and dances. They hold the mode of trading by the whites in great contempt. They say it displays a narrow and contemptible soul to be weighing and counting every trifle. The price is usually fixed by the chief and his council, and the nation as well as traders must submit.¹

The Crows annually visit the Mandans, Minnetarees, and Ahwahha ways, to whom they barter horses, mules, leather lodges, and many articles of Indian apparel, for which they receive in return guns, ammunition, axes, kettles, awls, and other European manufactures. When they return to their country they are in turn visited by the Paunch and Snake Indians, to whom they barter most of the articles they have obtained from the nations on the Missouri for horses and mules, of which those nations, i. e., the Paunch and Snake, have a greater abundance than themselves. They also obtain of the Snake Indians bridle-bits and blankets and some other articles which those Indians purchase from the Spaniards. The bridle-bits I have seen in the possession of the Mandans and Minnetarees.²

In the volumes of Lewis and Clark the Arikaree are described as middle men. Being agriculturists, their corn, beans, and other products enabled them to procure peltry from other tribes and to exchange these with the white traders for goods. The Arikaree are described as willing to give anything they had to spare for the most trifling article. One of the men gave an Indian a hook made out of a pin, and received in return a pair of moccasins.³

The buffalo is procured by the Skilloot from the nations higher up the river, who occasionally visit the Missouri; indeed, the greater proportion of their apparel is brought by the nations to the northwest, who come to trade for pounded fish, copper, and beads.⁴

The Chilkats and Chilkoots will not allow the inland tribes to approach the coast with their furs, but insist on acting as middlemen between them and the white traders. For this reason they assure themselves whether or not anyone comes to trade with these inland tribes.⁵

Among the coast Indians north of Puget Sound there are in each tribe officers who keep record of the mutual debts of individuals—a kind of public ledger. The astonishing thing is the fact that these men hold the accounts in their memories. There is also a fixed rule about interest—that is, the amount of property that must be returned for a gift or a loan.

The Makahs, from their peculiar locality, have been for many years

¹Brackenridge, "Views of Louisiana," 1811, p. 71.

²"History of the Expedition under the command of Lewis and Clark, 1804-1806," New York, 1893, I, p. 198, quoting from Lewis's "Statistical View," London, 1807, p. 25.

³Ibid., I, p. 164.

⁴Ibid., III, p. 957.

⁵H. W. Seton-Karr, Proc. Roy. Geog. Soc., London, 1891, XIII, p. 82.

the medium of conducting the traffic between the Columbia River and coast tribes south of Cape Flattery, and the Indians north as far as Nootka. They are emphatically a trading as well as a producing people; and in these respects are far superior to the Ulallams and other tribes on Fuca Strait and Puget Sound. Before the white men came to this part of the country, and when the Indian population on the Pacific Coast had not been reduced in numbers, as it has been of late years, they traded largely with the Chinook at the mouth of the Columbia, making excursions as far as the Kwinault tribe at Point Grenville, where they met the Chinook traders, and some of the more venturesome would even continue on to the Columbia, passing through the Chehalis country at Grays Harbor and Shoalwater Bay. The Chinook and Chihalis would in like manner come north as far as Cape Flattery; and these trading excursions were kept up pretty regularly, with only the interruption of occasional feuds.¹

All the tribes living on Puget Sound sold strings of dried clams and oysters to the interior tribes. The Haida went down to Vancouver Island every winter and dried these mollusks to carry home and use in barter.

It was their custom to catch and dry not only enough for their own use, but also a vast quantity for the purpose of trade with the inland and mountain tribes. Every fall they loaded their canoes with dried salmon and sturgeon and quantities of hiaquas and went to the Cascades (the rapids of the Columbia River, about 150 miles from its mouth), where they met the Indians from the mountains and plains and bartered their dried fish and hiaquas for slaves and for the skins and meat of the buffalo. They used the buffalo skins for making their summer wigwams and their winter clothing and beds. The gray seal, beaver, and otter were abundant in and about the mouth of the Columbia and its tributaries; and bear, panther, elk, and deer roamed the forests at will, but the Chinook were fishermen, not hunters, and killed only enough of the land game to partially supply them with meat and skins.

In olden times the Chinook dealt very largely in slaves. Trading as they did with the inland Indians—who were much of the time at war with each other, and, making slaves of their prisoners, desired a market that would take these slaves as far as possible from their native country—the Chinook had a fine opportunity to purchase and bring these slaves to the coast. These they sold to the tribes both north and south, realizing a handsome profit, and becoming the wealthiest nation in all that part of the country.²

On account of the demand for animal products, commerce extended in the Southwest over much greater expanses than might be supposed. Iridescent shells from the Gulf of California found their way to Zuñi through Sonora and the Colorado peoples. The Hova, who dwelt in

¹ Swan, "Indians of Cape Flattery," Washington, 1869, pp. 30-32.

² Strong, "Wah kee nah and Her People," New York, 1893, Putnam, pp. 126-127.

Sonora and Chihuahua, exchanged the feathers of the large green parrot for greenstone. At Casas Grandes, Bandelier saw turquoises, shell beads, and marine snails; among the latter, species found only in the West Indies or in the Gulf of California; among others, *Turritella broderipiana* from the Pacific, *Conus proteus* from the West Indies, and *Conus regularis* from the west coast of Mexico.¹

"The possession of turquoise in the small range of mountains called Cerillos gave the Tanos Indians, of Galisteo Basin, a prominent position among their neighbors. The Zuñi enjoy similar privileges, which cause their modest relations of commerce to extend as far as the interior of Sonora and the Colorado of the West."²

When Marcos de Niza was thirty days' journey from Cibola he talked with Indians who had been there. "Upon being asked why they had traveled so far from home, they answered that they were going in search of turquoises, hides of cattle, and other things; * * * that they were in the habit of going into the first cities of the province and serving the inhabitants by tilling the soil and in other occupations, for which they received in exchange hides and turquoises."³

The first President of Mexico had in his employ a Tejos Indian, the son of a merchant engaged in trading, in the interior of the country, bird feathers, to be made into plumes, for gold and silver. This Indian said he had made two trips with his father to Cibola.⁴ This connects the city of Mexico with Zuñi.

Bandelier speaks of the civilized tribes of Central Granada, who carried their salt over the beaten mountain paths to the cannibal inhabitants of the Cauca Valley and received gold in exchange for it.⁵

The most precious commodity among the Muysca was salt. In white cakes, like sugar loaves, it was carried over beaten paths from Bogota west to the river Cauca, and north from tribe to tribe down the Magdalena for a distance of 100 leagues. Regular markets were maintained, even in hostile territories, and the Muysca received in exchange for their goods, gold, of which they were destitute and which their neighbors had in abundance.⁶

Each tribe of British Guiana has some manufacture peculiar to itself, and its members constantly visit the other tribes, often hostile, for the purpose of exchanging the products of their own labor for such as are produced only by the other tribes. These trading Indians are allowed to pass unmolested through the enemy's country. When living among the Macusi, I was often amused by a number of those Indians rushing into my house, in the walls of which we had had windows pierced, who, with bated breath, half in joy, half in terror, used to point through the

¹ Bandelier, *Archæol. Inst. Am. (Am. Series)*, III, p. 39.

² *Ibid.*, p. 36.

³ Davis, "Spanish Conquest of New Mexico," p. 123.

⁴ *Ibid.*, p. 113.

⁵ "The Gilded Man," New York, 1893, p. 6.

⁶ *Ibid.*

window to some party of their enemies, the Arecunas, coming with cotton balls and blow pipes for exchange. It is these traders who carry with them the latest news.¹

8. *Money and its predecessors.*—The collection of primitive money in the U. S. National Museum includes those objects that among savages are prized not only for their intrinsic qualities, but because they afford fixed standards of wealth and media for the exchange of other commodities as they have been transported from tribe to tribe.

1. Shells, different species in different localities.
2. Disks of shell, that is manufactured money.
3. Feathers, in tufts or made up into standard ornaments.
4. Blankets, skins, and robes.
5. Cut stone.

Long-distance carrying and multiplied handlings, added to the cost of production, created money, and thus the things to be handled and carried were so greatly increased in number by the demand for them that the ultimate price was lowered by the transportation.

The original treasure of the Pueblo Indian consisted of shell beads, green stones, and of objects of worship. Many a good horse is still purchased from the Navajo by means of turquoises alone. Bandelier also refers to the exchange of turquoises for parrots' plumes, quoting Cabeça de Vaca.²

The Samoan women manufactured fine mats from "the leaves of a species of hibiscus, scraped clean and thin as writing paper and slit into strips about the sixteenth of an inch wide. When completed they were from 2 to 3 yards square. Few of the women can make them, and many months, yea, years, are sometimes spent over the plaiting of a single mat. These fine mats are considered the most valuable property, and form a sort of currency which they give and receive in exchange. They are preserved with great care. Some of them pass down in a family through several generations, and as their age and historic value increase they are all the more prized."³

9. *Markets, bazaars, and fairs.*—In a museum such things exist in pictures, photographs, and descriptions. In reality the market, the bazaar, and the fair are organized and temporary gatherings of merchants and buyers agreed upon for certain hours, months, or years for the purposes of exchange.

They become more and more world embracing. Primitively they are known to have existed on each of the continents and to have furnished temporary political and industrial centers of great stimulus. In all the epochs of culture few stimuli to universal travel have been greater. They are in the same class with convocations, anniversaries, and public fêtes. But they involve carrying no less than travel. In a paper now

¹ in Thurn, "Indians of British Guiana," London, 1883, p. 271.

² Bandelier, *Archæol. Inst. Am. (Am. Series)*, III, 1890, p. 213.

³ Turner, "Samoa a Hundred Years ago and Long Before," London, 1884, p. 120.

being prepared on American Aboriginal Industries a list of trade centers on the Western Continent will be given.

10. *Amnesty and laws of travel.*—Finally, there do not seem to have been anywhere in the world tribes of savages living contiguous that did not grant special amnesty to travelers and carriers and traders. From these agreements have sprung international law, the latest word in the comity of nations.

In the development of the rudiments of international law, the establishment of treaties, and agreements concerning amnesty the trader or mercator must have been a largely ruling motive. International law was and is largely evoked by the exigencies of trade movements.

“If any robbery fall out in travell, between persons of diverse States, the offended State sends for Justice. If no Justice be granted and recompence made, they grant out a kind of Letter of Mart to take satisfaction themselves, yet they are carefull not to exceed in taking from others, beyond the proportion of their own losse.”¹ There is no doubt of trade amnesty and the law of reprisals, but it is questionable whether the old rule was not interpreted as elsewhere to mean “an eye for an eye,” etc., or even more than that.

Cabeça de Vaca remained among the Charruco Indians six years (1528–1533), dressing like a savage. He traveled as a peddler from tribe to tribe over many hundreds of square miles. This was said to be convenient to the Indians because they could not traffic in time of war. Into the interior Cabeça carried sea snails and their corn, medicine, sea beads, etc., and brought back skins, ocher, flint, cement, arrow shafts, tassels of deerskin, ornamented and dyed red. He was treated kindly everywhere, the Indians trading food for wares. He became a person of great importance and was much sought after.²

As intimated more than once in this paper, travel and transportation by land pass in their elaboration from man power to the forces of physical nature through the epoch of beast power, and it will be in order, in a subsequent paper, to study out the rude appliances and methods of primitive peoples in their first employment of domestic creatures to carry them on their backs, to haul them in some sort of conveyance, or to draw loads for them.

There are a number of elements which enter into the organization of traveling on foot which pass into more definite forms as soon as beasts take the place of men in the labors here considered, such, for instance, are roads, bridges, harness, and others, which it will be necessary to consider or to investigate with much greater care in the study which follows.

It is also more than once mentioned that the two great phases of carrying were by land and by water. It will be in order, therefore, to follow this paper with a second one, in which should be studied out the

¹ Roger Williams, *Coll. R. I. Hist. Soc.*, I, p. 77.

² Davis, “Spanish Conquest of New Mexico,” *Doylestown*, 1869, p. 58.

inventions of the lower races of men pertaining to the use of water as a means of traveling or moving burdens. The first devices of this kind were simply floats for bearing up the human body or some sort of load, in order to move it across still water. Many substances were employed in this capacity, such as very light wood, the hollow stems of plants, the skins of animals inflated, and vessels of pottery. The second step in the elaboration of water conveyance was that in which some kind of displacement took the place of mere flotation. As soon as means were found to direct the course of a floating body, the ship was in progress of invention.

Among primitive forms for navigation the earliest represent the efforts of the human mind to devise the rudder, the fixed keel, the shifting sail, and means for storing up provisions for a long journey. As soon as these were achieved, savagery changed to barbarism or civilization, and the limits of this study were fixed.

H. Mis. 90, pt. 2—38

MANCALA, THE NATIONAL GAME OF AFRICA.

BY

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MANCALA, THE NATIONAL GAME OF AFRICA.¹

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The comparative study of games is one that promises an important contribution to the history of culture. The questions involved in their diffusion over the earth are among the vital ones that confound the ethnologist. Their origins are lost in the unwritten history of the childhood of man. Mancala is a game that is remarkable for its peculiar distribution, which seems to mark the limits of Arab culture, and which has just penetrated our own continent after having served for ages to divert the inhabitants of nearly half the inhabited area of the globe.

The visitor to the little Syrian colony in Washington street in New York City will often find two men intent upon this game. They call it Mancala. The implements are a board with two rows of cup-shaped depressions and a handful or so of pebbles or shells, which they transfer from one hole to another with much rapidity. A lad from Damascus

described to me the methods of play. There are two principal ways, which depend upon the manner in which the pieces are distributed

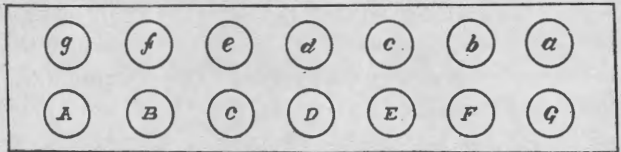


Fig. 1.

MANCALA.

From a figure by Lane.

at the commencement of the game. Two persons always engage, and ninety-eight cowrie shells (wada) or pebbles (hajdar) are used. One game is called La'b madjnuni, or the "Crazy game." The players seat themselves with the board placed lengthwise between them. One distributes the pieces in the fourteen holes, called bute, "houses," not less than two being placed in one hole. This player then takes all the pieces from the hole at the right of his row, fig. 1, g, called el ras, "the head," and drops them one at a time into the holes on the opposite side, commencing with a, b, c, and so on. If any remain after he has put one in each of the holes on the opposite side, he continues around on

¹ Read before the Oriental Club of Philadelphia, May 10, 1894.

his own row A, B, C. When he has dropped his last piece he takes **all** the pieces in that hole and continues dropping them around as **before**. This is done until one of two things happens—his last piece drops into an empty hole, when he stops and his opponent plays, or it drops

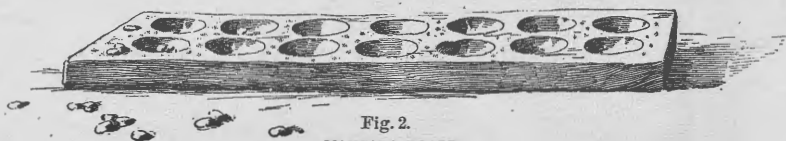


Fig. 2.
MANCALA BOARD.
Jerusalem.

Cat. No. 15296, Museum of Archaeology and Paleontology, University of Pennsylvania.

into a hole containing one or three pieces, completing two or four. In that case he takes the two or four pieces with those in the hole opposite, and if one or more of the holes that follow contains two or four with-

out the intervention of a hole with any other number, he takes their contents with those opposite. The second player takes from the hole *g*, and distributes his pieces around A, B, C. If the head is empty, the player takes from the next nearest hole in his row. When the

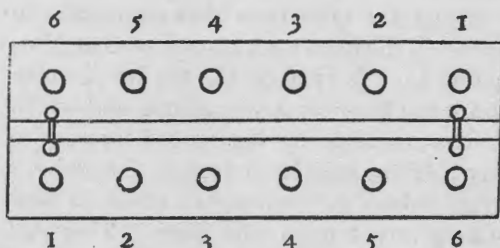


Fig. 3.
MANCALA BOARD.
From a figure by Hyde.

board is cleared, each player counts the number he has above his opponent as his gains. No skill is necessary or of any avail in this game, the result being a mathematical certainty, according to the manner in which the pieces were distributed in the beginning. La'b hakimi, the "Rational game," or La'b akila, the "Intelligent game," is so called in contrast to the preceding. Success in it depends largely upon the skill



Fig. 4.
BOARD FOR NARANJ (MANCALA).
Maldives Islands.

Cat. No. 16380, Museum of Archaeology and Paleontology, University of Pennsylvania.

of the players. In this game it is customary in Syria to put seven pieces in each hole. The players, instead of first taking from the hole on their right, may select any hole on their side of the board as a starting place. They calculate the hole in which the last piece will fall, and the result depends largely upon this calculation. La'b rosëya is a variety of the first game and is played only by children. Seven cowries are placed in each hole, and the first player invariably wins. My



TURKISH GIRLS PLAYING MANCALA.

From an old print.

Syrian friend told me that the shells used in the game are brought from the shores of the Red Sea. Mancala is a common game in Syrian cafés. Children frequently play the game in holes made in the ground when they have no board, a device also resorted to by travelers who meet by the way.

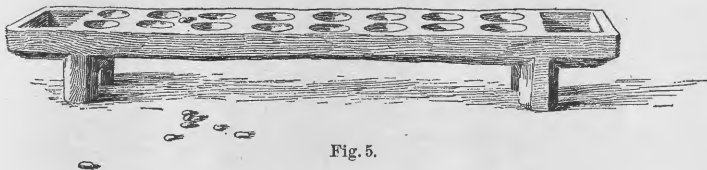


Fig. 5.

BOARD FOR NARANJ (MANCALA).
Maldive Islands.

Cat. No. 16379, Museum of Archæology and Palæontology, University of Pennsylvania.

A board in the Museum of Archæology, University of Pennsylvania, from Jerusalem, is shown in fig. 2, and one from Beirut, Syria, in pl. 2, fig. 1.

Mancala, the name which the Syrians give to this game, is a common Arabic word and means in this connection the "Game of transferring."



Fig. 6.

BOARD FOR CHANKA (MANCALA).
Ceylon.

Cat. No. 16381, Museum of Archæology and Palæontology, University of Pennsylvania.

It is not mentioned in the Koran by this name, but must have been known to the Arabs in the Middle Ages, as it is referred to in the commentary to the Kitab al Aghani, the "Book of Songs," which speaks of a "game like Mancala."

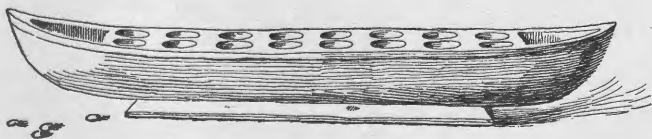


Fig. 7.

BOARD FOR CHONGKAK (MANCALA).
Johore, Malay Peninsula.

Cat. No. 16382, Museum of Archæology and Palæontology, University of Pennsylvania.

Dr. Thomas Hyde gave a very good account of it two hundred years ago in his treatise, "De Ludis Orientalibus" (see fig. 3), and Lane, in his "Manners and Customs of the Modern Egyptians," describes it very fully as played in Cairo upon a board with twelve holes, quite in the manner I have related. Seventy-two shells or pebbles are there used, and,

whether shells or pebbles, are indifferently called hasa. The hemispherical holes in the board are called buyoot, plural of beyt. The score of the game is sixty, and when the successive gains of a player amount to that sum he has won. I soon found that I had learned from

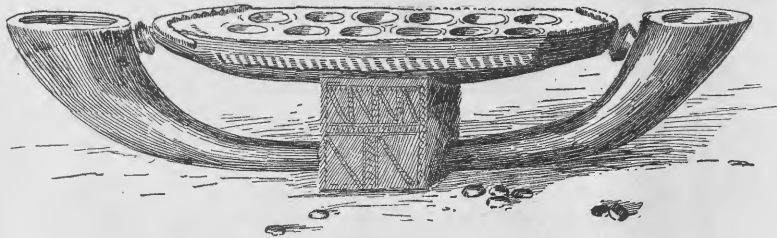


Fig. 8.

BOARD FOR POO (MANCALA).

Liberian Exhibit, World's Columbian Exposition.

my Syrian acquaintance nothing that had not been recorded, but upon visiting the Damascus House in the Turkish village at the Columbian Exposition at Chicago, I was enabled to engage with the Syrians in

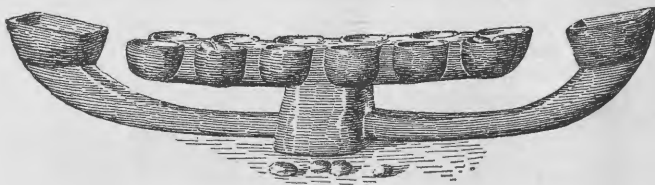


Fig. 9.

BOARD FOR POO (MANCALA).

Liberian Exhibit, World's Columbian Exposition.

the game, and was impressed with the peculiar distribution of the game over the world. The Ceylon exhibit contained boards from the Maldives with sixteen holes in two parallel rows, with a large hole at either

end. (Figs. 4 and 5.) Here the game is called Naranj. Boards in the same exhibit from Ceylon had fourteen holes with two large central cavities (fig. 6), the game being called Chanka. An

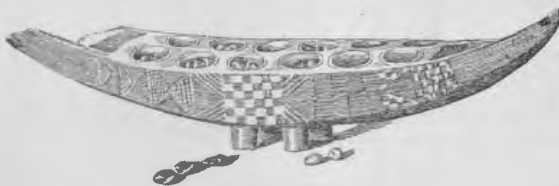
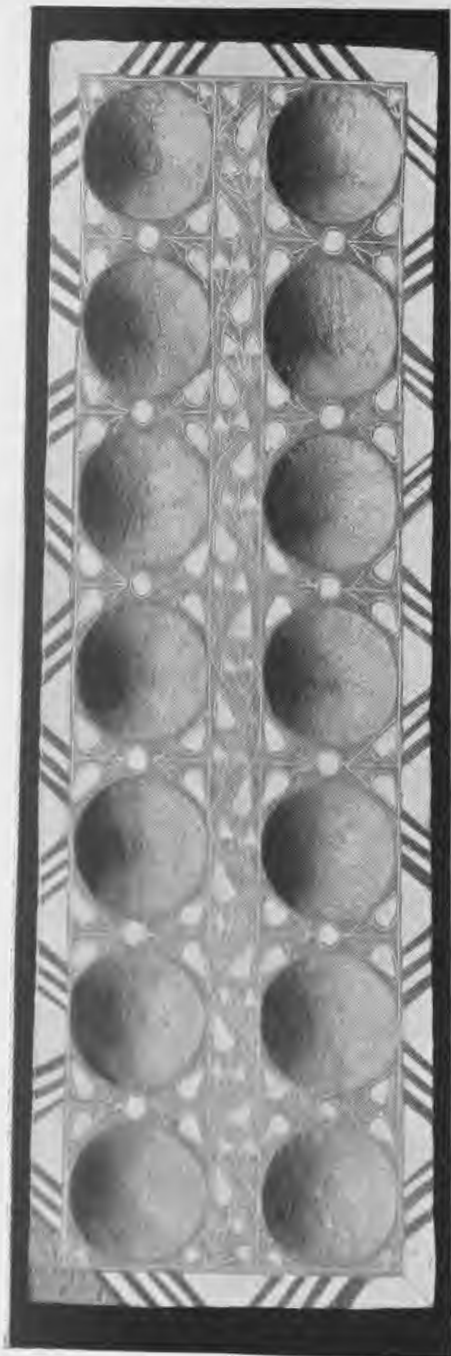


Fig. 10.

BOARD FOR POO (MANCALA).

Liberian Exhibit, World's Columbian Exposition.

Indian gentleman informed me that the game was common at Bombay. His Highness the Sultan of Johore exhibited a boat-shaped board with sixteen holes (fig. 7) under the name of Chongkak. I learned, too, that the game was common in Java, as well as in the Philippine Islands, where a boat-shaped board with sixteen holes is also used (pl. 2, fig. 2).



MANCALA BOARDS.

FIG. 1.—MANCALA BOARD.
Beirut, Syria.
Cat. No 164700, U. S. N. M.

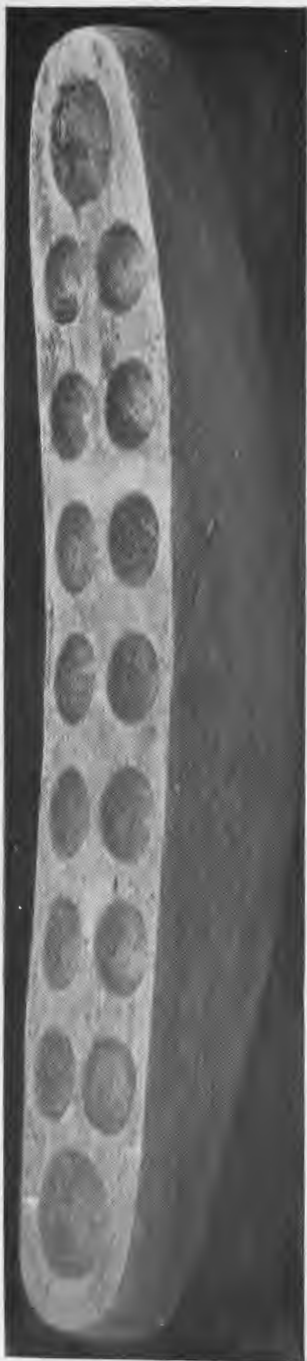


FIG. 2.—BOARD FOR CHUNCAJON (MANCALA).
Philippine Islands.
Collected by Alexander R. Webb. Cat.
No. 154195, U. S. N. M.

the game being called *Chungeajon*. It would thus appear that the game extends along the entire coast of Asia as far as the Philippine Islands. Mancala and a kind of draughts were the favorite amusements of the negroes from the French settlement of Benin on the west coast of Africa in the so-called Dahomey village at the Columbian Fair. They played on a boat-shaped board, with twelve holes in two rows, which they called *adjito*, with pebbles, *adji*, the game itself being called *Madji*. It is with the continent of Africa that the game of Mancala seems most closely identified. It may be regarded, so to speak, as the African national game. In the exhibit of the State of Liberia at Chicago, there were no less than eleven boards, comprising three different forms, said to be from the Deys, Veys, Pesseh, Gedibo, and Queah. (Figs. 8, 9, and 10.) They were catalogued under the name of *Poo*, by which name the game is known to civilized Liberians. The game is, in fact, distributed among the African tribes from the east to the west and from the north to the south. In Nubia, where a board with sixteen holes is used, it is known as *Mungala*.

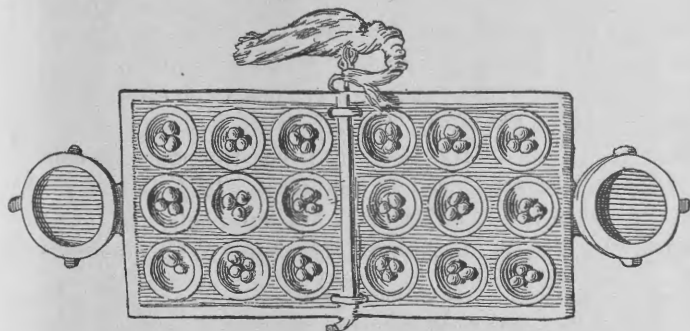


Fig. 11.

BOARD FOR GABATTÀ (MANCALA),
Abyssinia.

From a figure in the "Sacred City of the Ethiopians," by J. T. Bent.

In the narrative of the Portuguese embassy of Alvarez to Abyssinia (1520-1527) reference is made to "Mancal" as an unknown game, antiquated in the reign of Don Manuel. Bent has recently described it as still existing in Abyssinia under the name of Gabattà.¹ (Fig. 11.) Dr.

Speaking of the peasants of Sallaba, he says: "These primitive people are perfect artists in cow dung. With this material they make big jars in which to keep their grain, drinking goblets, and boards for the universal game, which the better class make of wood. I brought one of these away with me to show how universal this game is among the Abyssinians, from the chief to the peasant, and it reached the British Museum unbroken. This game is called Gabattà, and the wooden boards made by the better class contain eighteen holes, nine for each person. There are three balls, called *chachtma*, for each hole, and the game is played by a series of passing, which seemed to us very intricate, and which we could not learn; the holes they call their *toukoul*s, or huts, and they get very excited over it. It closely resembles the game we saw played by the negroes in Mashonaland, and is generally found in one form or another in the countries where Arab influence has at one time or another been felt." ("The Sacred City of the Ethiopians," London, 1873, pp. 72-73.)

George Schweinfurth states that it is played by the Niam-Niam, and is constantly played by all the people of the entire Gazelle district, although perhaps not known to the Monbutto. The Niam-Niam call the board, which has sixteen cavities, with two at the end for the reception of the cowrie shells, Abangah, (fig. 12) and the Bongo name for the board is Toeë. He also says that it is found among the Peulhs, the Foolahs, the Toloofs, and the Mandingos in the Senegal countries, who devote a great portion of their time to this amusement. Rohlf's found it among the Kadje, between the Tsad and the Benue.¹ It also occurs among the



Fig. 12.

BOARD FOR ABANGAH (MANCALA) USED BY THE NIAM-NIAM.

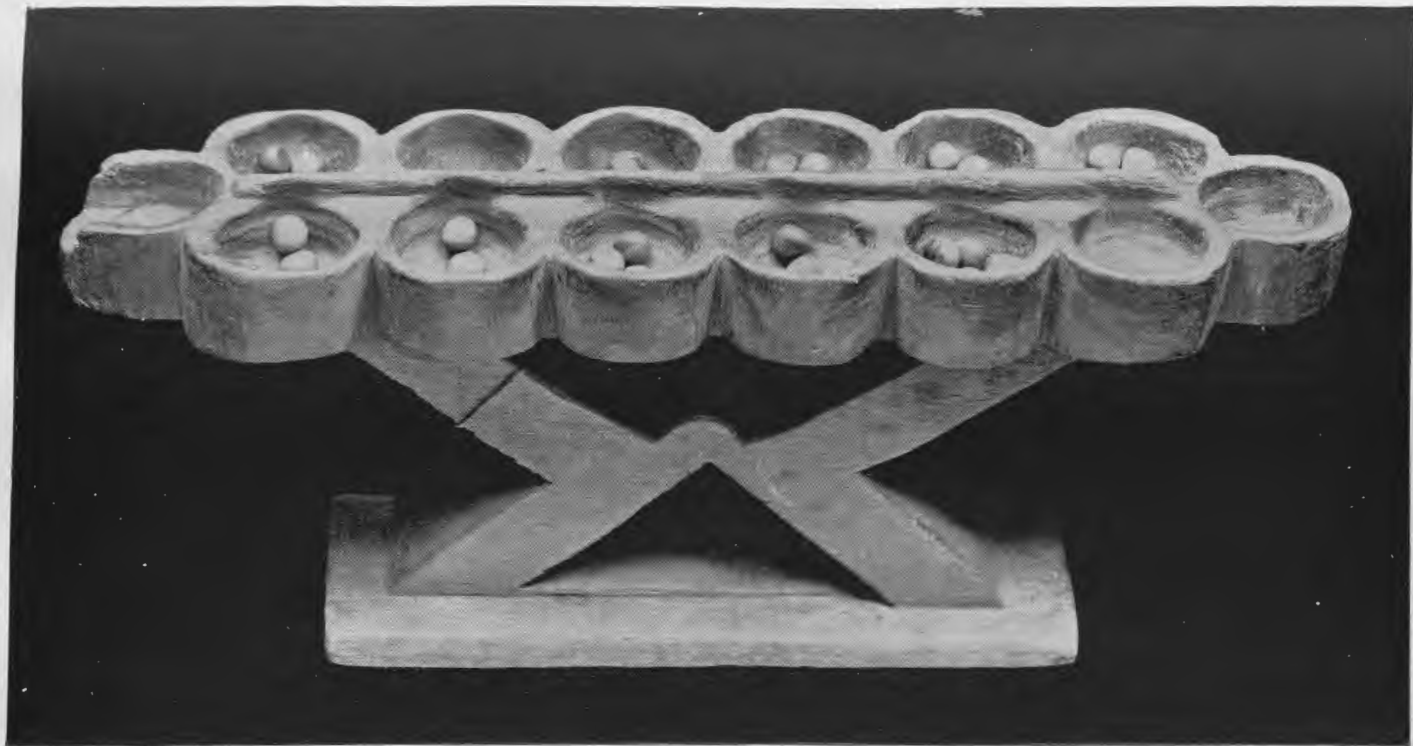
From a figure in "Artes Africane," by George Schweinfurth.

Biafren and the Kimbunda. Héli Chatelain, who lived for some time at Angola, described the game to me under the name Mbau, and said that cavities are cut in the rock for this game at the stations where the porters halt. A board collected by him at Elmina, now in the U. S. National Museum, Washington, D. C., has twelve holes in two rows, with large holes at the ends. (Pl. 3.)

Among the Fans of the Gaboon River the game is called Kale,² after the bean-like seed used in counting. (Fig. 13 and pl. 4, fig. 1.) Another board in the U. S. National Museum, collected by that adventurous traveler, Dr. W. L. Abbott, from the Wa Chaga tribe at Mount

¹Richard Andree, "Ethnographische Parallelen," neue folge, Leipzig, 1889, p. 102.

²The collector, Rev. A. C. Good, gives the following account of the game: "Two players seat themselves on opposite sides of the board, and four counters are placed in each of the twelve pockets. Then one player takes the counters out of a pocket on his own side and drops one in each pocket around as far as they will go, going to right and back on his opponents side in the opposite direction from that in which the hands of the clock move. They move thus alternately until one manages to make his last counter fall in a pocket on his opponent's side, where there were only one or two counters. When he has done so he has won the counters in that pocket, including his own last counter. These he transfers to the receptacle in the end of the board to his right. A single counter taken from last pocket on player's right can not win from opponent's first pocket opposite, even though it contains only one or two counters. When a pocket has accumulated twelve or more counters, so that a player drops clear around and back to where he began, he must skip the pocket from which he started. When so few counters remain in the pocket on the board that no more can be won, the game is ended and each counts his winnings. The counters that remain in the board at the end of the game are not counted by either player. The game is sometimes varied thus: When a counter wins as above, not only the contents of that pocket is won, but of the pocket or pockets before it on the opponent's side that has contained only one or two counters back until one is reached that has been empty or had three or more counters before the play. This last is rather the better game of the two. The Fans do not play these games skillfully. They seem unable to count ahead to see where the last count will fall. A white man, as soon as he understands the game, will beat them every time.



BOARD FOR MBAU (MANCALA).
Elmina, Africa.

Collected by W. H. Brown. Cat. No. 151128, U. S. N. M.

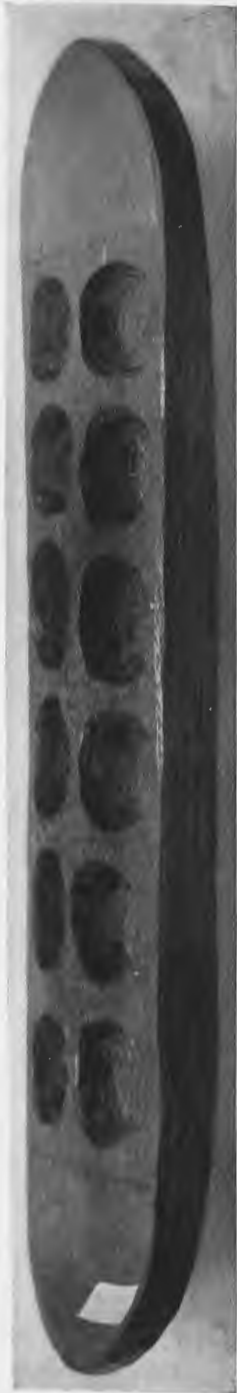


FIG. 1.—BOARD FOR KALE (MANCALA).
Falls of Gaboon River, Africa.
Cat. No. 164869, U. S. N. M.



FIG. 2.—ÓCHI BOARD FOR BAU (MANCALA).
Mount Kilima-njaro, Africa.
Collected by Dr. W. L. Abbott. Cat. No.
181805, U. S. N. M.

MANCALA BOARDS.

Kilimanjaro, has twenty-six holes arranged in four rows of six each, with two large holes at the ends. (Pl. 4, fig. 2.) He describes it in his catalogue, published by the Smithsonian Institution, under the name of Óchi, used for playing Bau, a common game throughout Africa, and says that it is played with nicker seeds and pebbles. Bent, in his "Ruined Cities of Mashonaland," gives the following account of the game: "Huge trees sheltered the entrance to their village, beneath which men were playing Isafuba, the mysterious game of the Makalangas, with sixty holes, in rows, in the ground. Ten men can play at this game, and it consists of removing bits of pottery or stone from one hole to another in an unaccountable manner. We watched it scores of times while in the country, and always gave it up as a bad job, deciding that it must be like draughts or chess learned by them from the former civilized race who dwelt here." He then proceeds to identify Isafuba with the games of Wari played on the west coast of Africa.

Prince Momolu Massaquoi, son of the King of the Vei tribe, described to me the manner of playing the game among the Vei. They call the game Kpo, a word having an explosive sound resembling a note of the

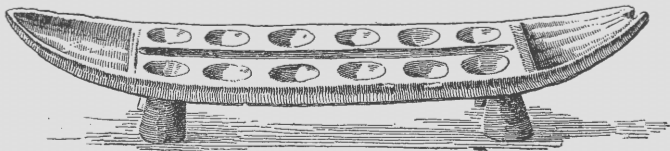


Fig. 13.

BOARD FOR KALE (MANCALA).

Gaboon River, Africa.

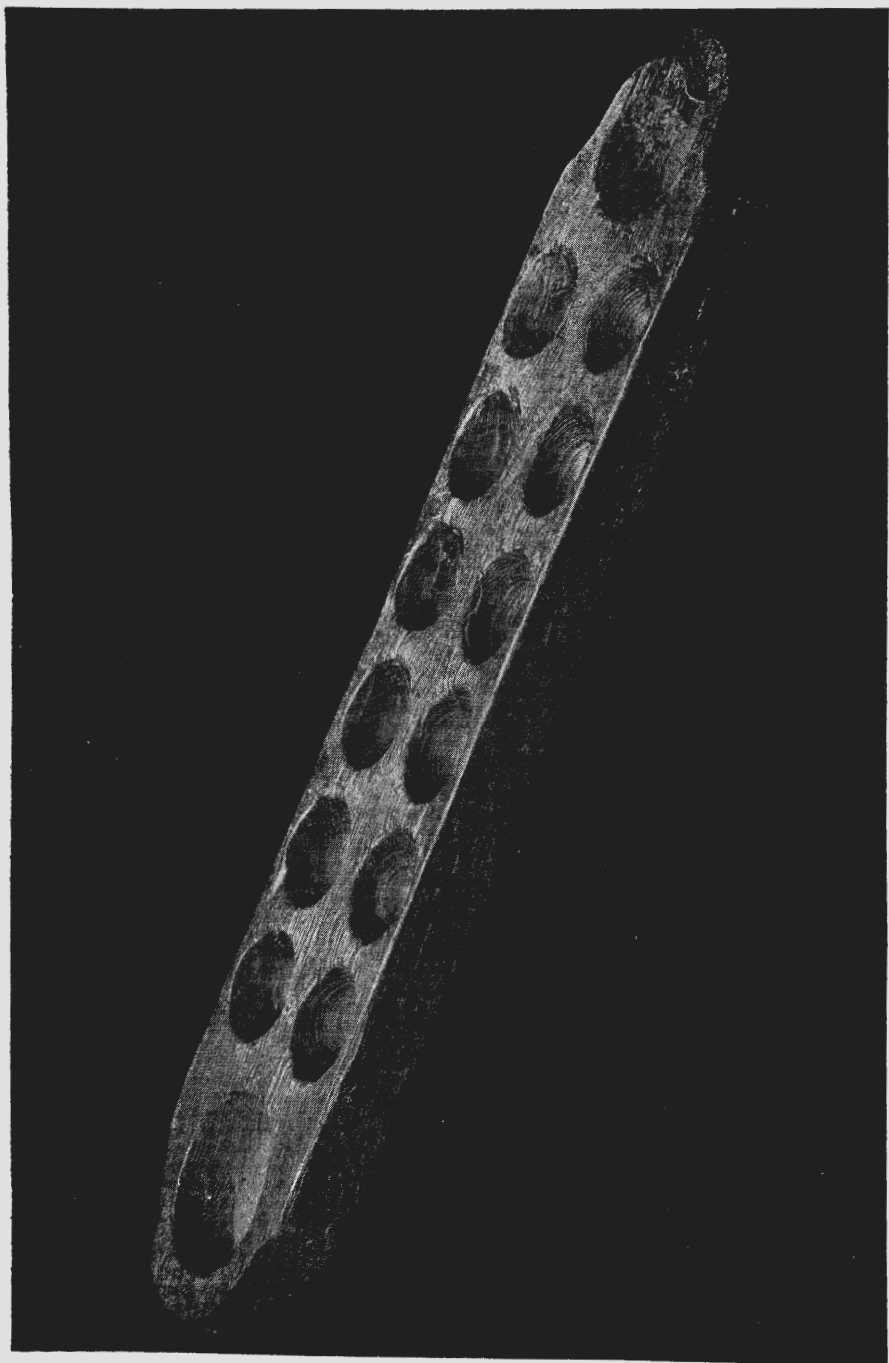
From a specimen in the Museum of Archaeology and Palaeontology, University of Pennsylvania.

xylophone, mimicking the noise made by the seeds or ivory balls with which the game is played when tossed into the holes on the board. The boards, which are made with twelve holes in two rows, with large holes at the ends, are called by the same name. The boards used by the chiefs are often very expensive, being made of ivory and ornamented with gold. He had seen boards which cost 20 slaves. The holes in the boards are called kpo sing or kpo kungo, kungo meaning "cup." The game is usually played with sea beans, which grow on vines like the potato on the west coast, or by the chiefs with the before-mentioned ivory balls. These seeds are called kpo kunje, kunje meaning "seed." He identified a board from the Gaboon River as suitable for the game, although he said that much more elaborate ones, like those in the Liberian exhibit, were common. The depression in the middle of the board from the Gaboon River is intended to catch pieces that do not fall in the hole for which they are intended. Cheating is practiced, and to guard against it players must raise their arms and throw the pieces upon the board with some violence. Two, three, or four play. The game differs somewhat from that played in Syria and Egypt. A player may commence at any hole on his side. His play

ends when the pieces first taken up are played. He wins when the number in the last hole is increased to two or to three. He does not take those in the hole opposite. When two play, four beans are put in each hole, but when three or four play three beans are put in each hole. When two play, the pieces are dropped around in the same direction as in the Syrian game, but when three or four play they may be dropped in either direction. When two play, each player takes one side of the board; when three play, each takes four holes, two on each side, dividing the board transversely into three parts, and when four play, each takes three holes. When two play, a winner takes only what he "kills" (fá); but when three or four play, when one completes two or three in a hole by his play, he takes those in the next hole forward. When a man takes a piece with one next to it, he uses his fingers to squeeze the pieces into his hand, the operation being called "squeezing" (boti), but this can only be done when one of the pieces is in one of the player's own cups and the other one or two in that of an opponent. Players sit crosslegged upon the ground, and when the chiefs play large numbers often assemble to watch them. I have given Prince Momolu's account somewhat at length, as several African travelers have declared the game incomprehensible to a white man.

Dr. Schweinfurth regards the Mohammedan Nubians as having received Mancala from their original home in Central Africa, and says that the recurrence of an object even trivial as this is an evidence, in a degree indirect and collateral, of the essential unity that underlies all African nations. Mr. Bent justly says that the game is found in some form or another wherever Arabian influence is felt, but, continuing, states that it forms for us another link in the chain of evidence connecting the Mashonaland ruins with an Arabian influence. Dr. Richard Andree, in his well-known work on *Ethnological Parallels*,¹ in which he has brought together many accounts of the game, says that he regards its progress from west to east, from Asia to the coast of the Atlantic. This opinion I share. Peterman relates that Mancala is played in Damascus with pebbles which pilgrims collect in a certain valley on their way from Mecca. From the comparatively early mention of the game in Arabic literature, and the retention of its Arabic name in Africa, Arabia would appear to be the source from which it was disseminated. Mohammed proscribed the Meiser game; and games of hazard, although played, are regarded by Mohammedans as prohibited by their religion. Mancala, a game of fate or calculation, appears to be looked upon with toleration, and it is not unreasonable to suppose that its wide diffusion is due to its having been carried by returning pilgrims to the various parts of the Mohammedan world. If we accept this theory of its distribution, we have yet the more difficult question of its origin. This, I fear, is not to be determined directly, and will only be surely known when we attain a greater knowledge of the rules

¹ "Ethnographisch Parallelen," neue folge, Leipzig, 1889, p. 101.



BOARD FOR WA-WE (MANCALA).

Island of St. Lucia.

Collected by Rev. F. Gardiner. Cat. No. 151286, U. S. N. M.

or laws which underlie the development of games, even as they do every other phase of the development of human culture.

I have recently been informed that Mancala is a common amusement of the negroes of San Domingo, who play upon boards scooped with holes. A board in the U. S. National Museum (pl. 5) was collected by the Rev. F. Gardiner, jr., in St. Lucia, where the game is played by the negroes under the name of Wa-wee.¹

It is not unlikely that Mancala may some day take its place among our own fireside amusements, when this account may answer some inquiries that may be made as to its history.

Since the above was written I have learned that the game of Mancala was published in the United States in 1891, under the name of Chuba, by the Milton Bradley Company, of Springfield, Mass., who furnish the following rules and account of the game:

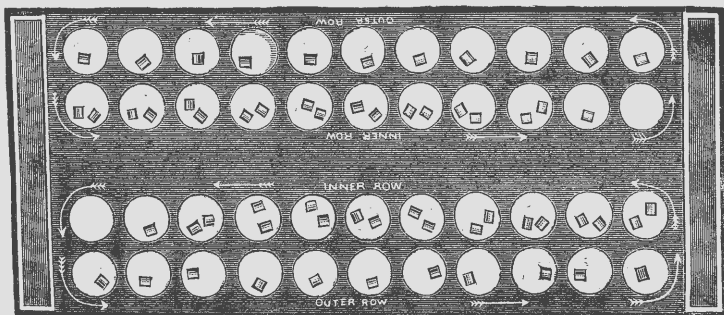


Fig. 14.

CHUBA.

Position of men at opening of the game.

Chuba is an adaptation from a rude game of eastern Africa which is greatly enjoyed by the natives, who squat on the ground and play in holes scooped out of the sand, using shells, young cocoanuts, etc., for counters, which they move from hole to hole. As now presented to the civilized world for its diversion, Chuba is a game of skill for two players. It is made up of a board with 4 parallel rows of holes or pockets, 11 in each row, and 60 small beads used as men or counters. [See fig. 14.]

The board is placed between the players as usual, with the longer sides next to them. Each one confines his playing to the two rows of pockets nearest him. The row close to his edge of the board is his outer row, while the other is his inner row.

¹ Mr. Gardiner writes in a letter to Dr. G. Brown Goode under date of May 2, 1895: "The game of Wa-wee was bought in St. Lucia, but I found it in use also in Barbados and Martinique among the negroes. As far as I could ascertain, they supposed it very old—came from their fathers. I supposed it came from Africa; but no one seemed to know anything about it. It is a regular gambling game." In regard to the method of play, he says: "As near as I can remember, each of the small side holes has a given number of beans put in, each man taking one side and one large hole as a goal. The beans are taken up from one hole in the hand and dropped in a certain order in the other holes, going round the whole circle. If the last one drops in a hole which has a certain number of beans in it (I don't remember the number), he picks that lot up and goes on. The object is to land the most beans of your own and taken from your adversary in the end holes."

Before beginning the game each player places a single counter in each of the pockets of his outer row and two counters in each pocket of his inner row, except that the pocket on his extreme left in the inner row is kept vacant and the one next to it holds but one man. The above diagram shows the arrangement of the board at the opening of the game. As indicated by the arrows, all moves in the inner row are from right to left, and those in the outer row from left to right. As the players face each other the moves in the two inner rows are necessarily in opposite directions.

The privilege of playing first in the first game is left to agreement or chance, not being regarded as of any consequence. In subsequent games the player who was victor in the last contest takes the lead.

The first player chooses any pocket in his inner row which contains more than one man from which to start his first move, and begins the game by picking up all the men in that pocket and dropping one of them in each of the consecutive pockets to his left until all the men in his hand have been distributed. If the last counter drops into a pocket that is occupied, the player continues the move by picking up all the men in that pocket, including the one dropped, and disposing of them as before. His move must continue in this same way until the last counter in his hand falls into an empty pocket, and the move may extend around the course, into the outer row, or even farther, as indicated by the arrows.

If this empty pocket into which the last man falls is in the inner row and has

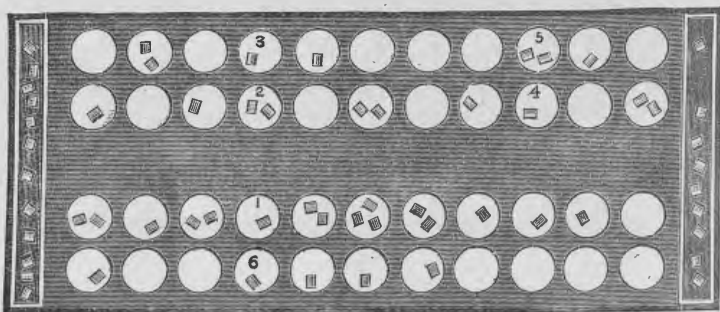


Fig. 15.

CHUBA.

opposite it a pocket in the opponent's inner row containing one or more men, the player captures these men and at once removes them from the board. And if there are one or more men in the corresponding opposite pocket of the opponent's outer row, they must also be taken. Furthermore, he must select another pair of opposite pockets in his opponent's rows from which to remove any men that they contain. In making this choice he is at liberty to pick out any pair of opposites, whether both are occupied or empty, or one is occupied and the other empty. The accompanying diagram will explain the meaning of this rule. [See fig. 15.]

Suppose the player B had just finished a move by dropping a "last man" in No. 1. He can capture all the men in 2 and 3 by his skill and also in 4 and 5 or from any other two opposite pockets of his opponent's inner and outer rows. Had 2 been vacant, however, he could not have taken any men. Had 3 been vacant, he could have taken the men from 2 and those from 4 and 5. Had his last man fallen in the outer row, in 6 for example, the effect would have been of no avail in capturing anything, because the outer row is always noncombatant.

A man in the outer row can not be moved until he has been played upon by a man from the inner row.

A move can not begin from a pocket holding a single man if the player has a pocket containing more than one man. When a move does begin from a pocket containing a single man, it can not be played into an occupied pocket.

When all the men which a player has become single, those remaining in his outer row which have not been played on are forfeited to the opponent.

The winner is the player who captures all his opponent's men.

It is an advantage to a player to get his counters singled as soon as possible, unless he sees that his opponent is doing the same thing, when a different policy is wise.

If he wishes to cover two or three vacant spaces in order to effect a capture, it can often be done, provided he begins his move far enough back from those vacant pockets.

The loss of counters during the earlier part of the game is not necessarily as great a disadvantage as in most games, because so much depends on the final move, in which there is the chance for a brilliant display of skill.

The native players of the original Chuba say "chee" at the end of each move, which gives notice to the opponent to proceed; and toward the close of the game, when the moves follow in rapid succession, the effect is very amusing.

The natives call the counters in the inner row "man and wife," and those in the outer row "spinsters." But these spinsters are married by passing a counter over them from the inner row, till, in the progress of the game, all the pieces become single, when they are all called "widows." These widows have a double advantage over the married families, and are sure to make havoc among them. The game is appropriately named, as the word chuba means "to extinguish" or "eat up," and the object of each player is to annihilate his opponent by putting the latter's counters in a position from which escape is impossible.

THE GOLDEN PATERA OF RENNES.

BY

THOMAS WILSON,

*Curator, Department of Prehistoric Anthropology,
U. S. National Museum.*

THE GOLDEN PATERA OF RENNES.

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On the 26th of March, 1774, the city of Rennes, in the ancient province of Brittany, northwestern France, was thrown into great excitement over the discovery of a golden treasure by the masons engaged in the demolition (for reconstruction) of one of the chapter houses of the cathedral. The Abbé took the objects to what in the United States corresponds to the subtreasury of the Government, from which he received the following certificate:

I, the undersigned, money changer for the King at Rennes, certify that there has been presented to me at the close of the day March 26, 1774, by M. l'Abbé de la Croix, canon syndic of the church at Rennes, a round plate of gold, ornamented with figures in relief and several golden pieces of Roman money incrustated, three chains of gold and 94 pieces of Roman money in gold; all of which objects appear to be of the fineness of about 23 carats, and which I find to weigh together eight mares,¹ three ounces six gros and a half.

(Signed)

SOLIER.

A contest arose over the right of possession, but was terminated by the church authorities presenting the treasure entire to the King, Louis XV, by whom it was deposited in the Cabinet of Medailles and Antiques at Paris.

This treasure was found at a depth of 5 feet from the surface, in earth which had been filled, in ancient times, to a depth of 2 feet below the treasure. It was two or three feet outside the wall of the house being demolished, and which itself was of an ancient date. A grave with human bones (which fell to dust and were not saved) was found one and a half feet distant from, and three and a half feet deeper than, the spot occupied by the treasure. The objects were piled together, the patera horizontal, the emblema in place, and the chains and moneys placed thereon. They were without inclosure or inscription of any kind.

The color of the patera is that of our gold coin. Long contact with the earth had not tarnished it beyond the power of soap and water to renew by washing. The diameter of the patera is 10 inches; of the emblema or interior, 6 inches. Its height is 1½ inches, and weight 1 kilogram 315.50 grams, or 42 troy ounces; gold, 23 carats fine.

¹An ancient weight, corresponding to eight ounces troy.

This patera, like that of Bernay, is composed of two parts: (1) The emblema or bottom, on which is engraved the mythological subject; (2) the rim surrounding the emblema and forming the frame in which it is set. These are separate pieces and can be taken apart. In the patera of Bernay they were found separated and subsequently fitted together. In the patera of Rennes they were together and in place.

The emblema and the rim are not the same kind of work, and probably were not made by the same person. The former was the work of an artist—a designer, a sculptor, and a worker in precious metals, while the latter was, or may have been, the production of a mere handiworker. It has been contended, with reason, that there might have been artists or even establishments at great centers which made this kind of work and sold it to the gold and silversmiths elsewhere throughout the country or the world, to be finished with the added rim, on demand of the proper customer.

Mr. Waldstein, describing the patera of Bernay in the *Century Magazine*, November, 1886, supposes his emblema to have been made by the original artist at Ephesus, and for the possibility of its truth he cites the Acts of the Apostles, xix, 23.

The emblema of the patera of Rennes is gold, first cast, then by hammering, chiseling, graving, and burnishing, the figures are brought into high relief, and so finished to give expression to its subject.



Fig. 1.

EDGE VIEW OF GOLDEN PATERA OF RENNES.

The subject represented is a contest between Bacchus

and Hercules, to decide which can drink the most wine. Or, as Chabouillet says, it is an allegorical composition, showing the triumph of wine over strength. Such contests were common enough in ancient times. Millin, in his note on the subject, cites the ancient authors, Horace, Martial, etc., and says the combatants were challenged to drink nine cups in honor of the Muses and three in honor of the Graces. Sometimes the number of cups was determined by the number of letters in the name of the friend in whose honor they drank; sometimes by their fingers, other times according to the pride or capacity of the challenger, but always by some means to increase the quantity to be consumed.

Such contests are not unknown in modern times. German authorities are credited with having such a custom among their students, and Prince Bismarck has been cited as an illustrious and successful example in such contests.

Burns describes a contest of this kind wherein a whistle was the prize and the well-known Scotch drinking song says of such a bout:

Wha first shall rise to gang awa',
A cuckold coward loon is he;
Wha last beside his chair shall fa',
He shall be king amang us three.



THE GOLDEN PATERA OF RENNES.

Cast in U. S. National Museum. Cat. No. 125212.

The moment chosen by the artist for his representation of the scene is when the two combatants have just emptied their cups, and it is evident, from the appearance of the god of strength, that he is defeated. His eye is leaden, his head droops, he has dropped his club, and his left hand is reached out to the rock on which he sits to support his staggering, swaying body. His right hand still holds, as it were, mechanically the cup which he has just emptied, or perhaps only partially emptied. Inebriety is apparent in every lineament. Not so his opponent. Bacchus is seated firm and erect. His left arm encircles his thyrsus, while his right hand holds aloft the rhyton or cup in the form of a poppy, with its long stem turned upside down, to show that he has emptied it.

It was required that the cup should be emptied at a single draft. He who failed in this was out of the combat at once. It was a sign of great prowess to be able to pour the wine into the mouth and drink without allowing the lips to touch the cup. He who could thus empty the cup stood first chance to be "King among us three." Bacchus is crowned with ivy and vine leaves, and at his feet is his panther.

There are six spectators to the contest. Among them are Pan, with his pipes, Silenus, and a player on the double flute. The other three are Bacchantes. This scene occupies the center of the emblema, and is three and a half inches in diameter.

Encircling it is the border, one and one-fourth inches in width, six inches in diameter, and has itself a border wreath of laurel leaves entwined as a crown. Inside this crown, on a field about one inch wide, is the triumphal procession of honor of the victory just won by Bacchus. The procession is composed of twenty-nine personages and five animals. Bacchus is on his car drawn by two panthers, attended by his bacchantes, double-flute players, etc., the vanquished Hercules supported on either side by genii, one of whom carries his club and robe, Pan with his pipes, Silenus mounted on a camel, bacchantes, cymbal players, dancers, satyrs, the grape harvest, etc.

The border of the patera outside the emblema (not shown in the accompanying plate) is two inches in width, and is of plain gold burnished, with a rolled rim. In the middle of the border and at equal spaces around it have been inserted sixteen golden coins of the Roman emperors of the epoch. Each is encircled by a wreath of laurel leaves. These coins are placed in cavities or cases fitted for them. They are not soldered. They might have been taken out and used as coin of the realm. They have been taken out by the conservateur and their reverses read, recorded, and then returned to their places. The coins are not placed chronologically, but this examination of the conservateur showed they were placed as originally intended, for at the bottom of each cavity or case was the name of each coin made by punch marks (*pointillé*).

GOLD ROMAN COINS IN THE PATERA OF RENNES.

1. Hadrian, A. D. 117-138.

Obverse.—Bust, bare head, facing to right. Inscription. HADRIANUS. AVG. COS. III. P. P. Hadrian, mighty, three times consul, père patrie, father of his country.

Reverse.—Spain reclining. HISPANIA. This coin was struck in commemoration of the Emperor's visit to Spain:
Punched at bottom of case. HADRI.
2. Caracalla, A. D. 211-217.

O.—Bust, crowned with laurel, right. ANTONINVS. AVGVTVS.

R.—Geta. Bust, right, bare head. P. SEPT. GETA. CAES. PONT. Publius Septimus Geta Cæsar pontif.

Letters punched at bottom of case. ANTO. IVN. Antoninus junior. Rare.
3. Marcus Aurelius, A. D. 161-180.

O.—Bust, laurel crowned, right. M. ANTONINVS. AVG. ARM. PARTH. MAX. Marcus Antoninus, mighty, armenicus, parthicus, maximus.

R.—Victory marching to the left. In her right hand a crown and in her left a patera. TR. P. XXI. IMP. IIII. COS. III.

Punch marked. ANTO. AVG.
4. Faustina the younger.

O.—Bust, to right. FAVSTINAE. AVG. PII. AVG. FIL. To Faustine Auguste, daughter of Antoninus, pious, august.

R.—Joy, standing, to right, in right hand a crown, and in left a scepter. LAETITIAE. PVBLICAE.

Punch marked in case. FAV. AVG. Struck between A. D. 161 and 175. Rare.
5. Antoninus the Pious, A. D. 138-161.

O.—Bust, laurel crown, to right. ANTONINVS. AVG. PIVS. P. P. TR. P. XII. Antoninus, august, pious, father of his country, tribune twelve times.

R.—Liberality, standing with horn of abundance and balances. COS. IIII. Consul four times.

Punch marked in case. ANTO. AVG.
6. Geta, A. D. 211, 212.

O.—Bust, head bare, right. P. SEPTIMVS. GETA. CAES.

R.—Septimus Severus, seated between his two sons, Caracalla and Geta. PONTIF. COS. III. Pontif, consul two times.

Punch marked in case. SIIP. GETA. Seplenus Geta. Struck A. D. 208, and is extremely rare.
7. Commodus, A. D. 180-192.

O.—Bust, beard, laurel crown, right. M. COMM. ANT. P. FEL. AVG. BRIT. Marcus Commodus Antoninus, pious, happy, mighty, august, britanicus.

R.—Liberty, standing holding cap and spear. LIBERT. P. M. TR. P. XIII. IMP. VIII. COS. V. P. P. Liberty, grand pontif. Tribune thirteen times, proclaimed victorious eight times, consul five times, father of his country.

Punch marked in case. COM. SEN. Commodus senior. Struck A. D. 188. Rare.
8. Faustina, mother, wife of Antoninus the Pious; born 104 A. D.; died, 141.

O.—Her bust, to right. DIVA. FAVSTINA. The divine Faustina.

R.—Ceres, standing, in her right hand a flambeau and in her left a sceptre. AVGVSTA.

Punch marked in case. FAV. DI. The word Diva indicates that this coin was struck after her death and exaltation to divinity

9. Septimus Severus, A. D. 193-211.

O.—Bust, right, laurel crown. SEVERVS. PIVS. AVG. P. M TR. P. X. Severus, pious, mighty, august, grand pontif, tribune ten times.

R.—Caracalla and Geta, his sons, laurel crowned, full face. AETERNIT. IMPERI.

Punch marked in case. SEVE. Struck in 202. Rare.

10. Caracalla (see No. 2), A. D. 211-217.

O.—Bust, laurel crowned, right. ANTON. P. AVG. PON. TR. P. V. COS. Antoninus, pious, mighty, grand pontif, tribune, five times consul.

R.—Busts, together of Septimus Severus and Julia Domna, his wife. CONCORDIAE. AETERNAE. To the eternal concord.

Punch marked in case. ANTO. IVN. Antoninus junior. Struck in A. D. 202. Rare.

11. Antoninus the Pious (see No. 5).

O.—Bust, laurel crowned, left. ANTONINVS. AVG. PIVS. P. P. TR. P. COS. III. Antoninus, mighty, pious, father of his country, tribune, consul three times.

R.—Jupiter, seated, lightning in right hand and spear in left. IMPERATOR. II. Victorious two times.

Punch marked in case. ANT. AVG.

12. Faustina, mother (see No. 8).

O.—Bust, veiled, left. DIVA. FAVSTINA.

R.—Ceres, standing, left, a flambeau in each hand. AVGVSTA.

Punch marked in case. FAV. DIVA. Rare.

13. Antoninus the Pious (see Nos. 5, 11).

O.—Bust, laurel crowned, right. ANTONINVS. AVG. PIVS. P. P. TR. P. XI. Antoninus, mighty pious, père patrie, tribune eleven times.

R.—Liberality standing holding horn of abundance. COS. IIII. Consul four times.

In the field LIB. V. Commemorative of the public gifts made by this Emperor in A. D. 148.

Punch marked in case. AN. AV. Rare.

14. Commodus (see No. 7).

O.—Bust, right, bare head. COMMODO. CAES. AVG. FIL. GERM. SARN. Commodus, Cæsar, son of the mighty (Emperor then reigning), germanicus, Sarmaticus.

R.—Hilarity standing, left, in one hand a palm and the other horn of abundance. HILARITAS.

Punch marked in case. COM. IV. Commodus junior. Very rare.

15. Septimus Severus (See No. 9).

O.—Bust, laurel crowned. SEVER. P. AVG. P. M. TR. P. X. COS. III. Severus, pious, mighty, grand pontif, tribune ten times, consul three times.

R.—Bust of Julia Domna, full face, between her two sons, Caracalla and Geta. FELICITAS. SAECVLI. Felicity of the century. Rare.

Punch marked in case. SE. Severus.

Julia Domna.

O.—Bust, right. IVLIA. AVGVSTA. Julia the august, or the mighty.

R.—Happiness, standing, looking to the right with crown and wheel. LAETITIA. Happiness.

Punch marked in case. IVLI. Julia. Struck between A. D. 193 and 211. Rare.

These coins all belonged to the Imperial family of Antoninus, in the following chronological order:

Hadrian, Emperor, A. D. 117; died 138.

Antoninus Pius, A. D. 138; died 161; adopted by Hadrian.

Faustina, mother, his wife; died 141.

Marcus Aurelius, A. D. 161; died 180; adopted by Antoninus.

Faustina the younger; died 174; daughter of Antoninus; wife of M. Aurelius.

Commodus, son of preceeding, A. D. 180; died 192.

Septimus Severus, A. D. 193; died 211.

Julia Domna, his wife; died 218.

Caracalla, his eldest son, A. D. 211; died 217.

Geta, his second son, A. D. 211; died 212.

The presence of the coins of this family and the exclusion of those of Pertinax, who was a usurper, and assassinated Commodus and reigned between him and Septimus Severus, points to the conclusion that this patera was made by, or for, or commemorative of this family or some member or adherent of it. Hercules and Bacchus were the gods specially venerated by Septimus Severus and his family.

The oldest coin in the patera is that of Hadrian. He was chosen consul for the third time in A. D. 119. Therefore his coin bearing the inscription COS. III. must have been struck after that date. The latest coin is that of Geta, second son of Septimus Severus, who was proclaimed Emperor in A. D. 211, conjointly with his brother Caracalla, in pursuance of the testament of his father. He was assassinated by his brother and mother the year following. This coin is assigned to A. D. 208. It is rare.

Classic archaeologists have been able to fix the date of the fabrication of the patera at about the year A. D. 210. One can only guess the purpose of such a patera; evidently not for the ordinary use of gold plate. An object of the highest luxury and great expense, it could hardly have been in commemoration of an event, for the event is not signaled, nor as a testimonial to some person, for no person is named. Almost the only surmise left is that of a votive offering either to man or a god, and if a temple to Bacchus had been found in the neighborhood the enigma would be considered solved. But they know that Bacchus was worshipped and that temples in his honor existed. He is represented as victorious in this contest, and so this offering would be to him rather than to Hercules, who is defeated.

The destruction of all temples or altars erected or dedicated to pagan deities was decreed by the Emperor Theodosius in A. D. 391, and what more natural than that this treasure should have belonged to such a temple and have been buried to escape seizure. The testimony points to its intentional burial. All theories of accidental destruction of the temple or house in which it was stored, by fire, earthquake, etc., have been examined and rejected. So it has been agreed among the archaeologists who have given the subject the most profound study,

that the treasure was secreted by burial, and that this took place about the end of the fourth or beginning of the fifth century, A. D.

As a supplement to the history of the patera, its theft and recovery should be noticed. During the night of November 6, 1831, the Cabinet of Medailles and Antiques at Paris was entered by burglars, who, breaking open the cases, robbed them of their most precious and valuable objects, amounting to the sum of \$20,000 in coin value according to their weight, but infinitely more according to their rarity and antiquity. The patera was among them. The loss was great, the excitement correspondingly so, and the detectives and police were called upon to make their utmost endeavors. Only after eight months' search did they find traces of the robbers. By a descent upon the domicile of a gang of burglars they found 20 ingots of pure gold. Further examination caused them to dredge the river Seine under the bridge of Tournelle, where were finally recovered 1,500 of the pieces despoiled. The weight of these, added to that of the ingots, showed that all had been recovered, and the search ended.

In January, 1833, the burglars were condemned by the Court of Assize in Paris, one to forty, one to twenty, and one to ten years in the penitentiary.

For richness of design and delicacy of execution this ornate archaeological specimen will compare favorably with the gold work of modern times. It bears no trace and it makes no sign of its ancient service, of its interesting history, and the vicissitudes through which it has passed. Its origin will never be known, but it is curious that it should have lain buried in the earth for nigh twelve hundred years, and, though approached by a grave on the one side and a building on the other, that it should have remained untouched and unknown. It now reposes in the case of the Cabinet of Medailles and Antiquites in Paris, to be gazed upon by an admiring public, a testimony to the luxury of the ancient peoples and an evidence of the costliness and magnificence of their appointments: It, with other and similar specimens, shows them to have been the possessors of a higher civilization than we had before supposed.

THE WOODEN STATUE OF BARON II KAMON-NO-KAMI
NAOSUKÉ, PIONEER DIPLOMAT OF JAPAN.

Translation by H. SATOH of the label accompanying the statue.

THE WOODEN STATUE* OF BARON II KAMON-NO-KAMI NAOSUKÉ, PIONEER DIPLOMAT OF JAPAN.

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This statue, which is figured in the accompanying plate and which was presented to the U. S. National Museum by Shima Sekka, who also sculptured it, represents the Baron in the full costume of his rank. The string of his head-dress and the tablet held in his hand are those which he actually used in his lifetime. The difference between the style of his costume and that of the uniform now worn, shows the change that has taken place since his time, which is separated from the present by only four decades. In those days a conflict necessarily existed between the old and the new, and the resulting confusion and disturbance involved the sacrifice of many lives, among which the most noteworthy was that of Ii Naosuké, known in foreign annals as Ii Kamon-no-Kami. In the midst of a strong anti-foreign feeling, the principal cause of the social disquietude of the era, the first nation with which the Baron concluded a treaty of commercial intercourse was the United States of America. That treaty cost him his life. It is hoped that the statue reflects some of the great spirit which moved him to cement such happy relations between the two nations in the midst of the dangers and difficulties of the era. His death has borne noble fruit in the close and amicable ties now binding the two peoples. Some evidence of this mutual sentiment is furnished by Japan's earnest and prompt participation in the great World's Fair. She sent thither the best productions of her art and of her industry, thus indicating not only her friendly disposition, but also her desire to develop in every sense her relations with the United States. On this rare occasion the statue of a statesman who died to achieve friendship between two nations, and whose name will be cherished so long as the fruit of his death survives, may serve the double purpose of recalling his memory and of redirecting public attention to his merit as a diplomatist and a patriot.

A brief historical sketch, to show how and why a wise policy resulted in cruel assassination, may not be amiss in this place. About two hundred and fifty years ago the coming of Jesuit missionaries to Japan caused political troubles which ultimately gave birth to a strong anti-foreign spirit. The country was closed to all foreign nations, and any intercourse with foreigners entailed the severest penalty of the law.

* Exhibited at the World's Columbian Exposition in 1893.

The very term "foreigner" became synonymous with enemy. Things continued in this state for more than two centuries. When Commodore Perry arrived in Japan, in 1853, as ambassador of the United States, the Government of Japan was more or less disjointed. The Emperor (Mikado), who held his capital in Kioto, was sovereign of the land, but his generalissimo, the Shogun, who had his seat of government in Yeddo (the present Tokyo), held the reins of administrative power and exercised sway throughout the Empire. Hence, foreign Governments naturally opened negotiations with the Shogunate. But the whole of Japan was opposed to intercourse with foreign countries. All the feudal barons approved a policy of exclusion. The Shogun sought to obtain the Emperor's consent to treaties with foreign nations, but in vain, for all His Majesty's counsellors were against such a departure from the traditions of the land. Frequent changes took place in the cabinet of the Shogunate, and in this time of friction and vicissitude Ii Naosuké accepted the office of prime minister in the Shogun's Government. Lord of the castle of Hikone, in Omi Province, his family had long occupied a prominent position among the subject barons of the Tokugawa Shogunate. In that era the office of premier (tairo) was not filled except in times of urgency, and was invested with almost dictatorial authority. In this capacity the Baron of Hikone assumed the whole responsibility of negotiating with foreign powers. In 1858 he concluded a treaty with the United States. He is said to have resolved upon this course after a conversation with Mr. Harris, envoy extraordinary and minister plenipotentiary of the United States in Japan, on the subject of the war between China and England and the actual state of affairs outside Japan. This treaty was concluded without the approval of the Emperor. It led to the growth of a strong feeling of enmity, which culminated in the assassination of the Baron, in 1860, while on his way from his residence in Yeddo to the Shogun's palace, his assassins being violent representatives of the anti-foreign policy.

Had it not been for the penetrating foresight of the strong-minded man and the resolute stand he made against the public opinion of his time, Japan might have adhered to the traditions of isolation which she shared with the rest of the Orient, and might find herself in a position radically different from that which it is now her fortune to occupy. Hated as Prime Minister Ii Naosuké was in those days, his name has gradually come to be cherished and revered by the sons and daughters of the land of the Rising Sun, and his memory is now honored as that of one who courageously upheld a wise and liberal policy at the risk of his own life, and finally died cruelly under the swords of assassins in the very prime of his career.



STATUE OF BARON Ii KAMON-NO-KAMI NAOSUKÉ, PIONEER DIPLOMAT OF JAPAN.
Presented to the U. S. National Museum by Shima Sekka.

A STUDY OF THE PRIMITIVE METHODS OF DRILLING.

BY

J. D. MCGUIRE.

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The earliest remains of man are found associated with implements of his manufacture in which holes have been artificially perforated. Generally, these objects consist of bone, ivory, or shell. The means by which they were worked have caused discussion among archæologists, and a satisfactory solution of the question does not appear to have been reached.

During the cave period, in which man lived with and hunted the ancestors of animals that his descendants would hesitate to attack at the present day with modern weapons, we find him possessed of the so-called "batons of command," which have been bored with extreme care from reindeer horn and often carved with representations of animals or of man. These implements frequently show artistic merit. On one of them is seen a browsing deer or basking seal; on another, the hunter, while on others the representation may be of inanimate objects. At times in the same cave layers are found representations of Quaternary men or beasts, etched or engraved on plates of stone or ivory, or it may be the seal rudely cut on a bear's tooth which has a hole, for its suspension, carefully bored through its base. And this art is by all European archæologists said to belong to the period of Paleolithic man, who, while so skilled as an artist, they argue, was in so low a stage of mechanical development that he was unable to fashion from chipped stone any tool save the rudest. It is even asserted that the skill evidenced in the carved bones from the caves is proof of the presence of Paleolithic man and not of his Neolithic successor. This assertion is sustained, according to the argument, by the suggestion that the man of the caves has his descendant in the Eskimo, whereas Neolithic man was of a different race. Men of the early cave period had mastered the art of accurately boring bone and the teeth of animals, and, necessarily, all softer substances; of this fact all cave explorations bear testimony.

The "batons of command" present some variety, as they are sometimes found without the slightest signs of ornamentation; often these curious implements are bored, or it may be that the hole has been carefully cut out. For what purpose this perforation was made is not clear,

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The "batons of command" present some variety, as they are sometimes found without the slightest signs of ornamentation; often these curious implements are bored, or it may be that the hole has been carefully cut out. For what purpose this perforation was made is not clear,

unless it was to give elasticity to the implement or was intended to facilitate suspension. Ed. Lartet, the distinguished French archæologist, considers these implements to have been used as insignia of office, and likens them to the baton of a field marshal. He believes, further, that the number of holes indicates the chieftain's power—the greater the number of holes the greater the power. This suggestion is quite in accordance with the teachings of the European school, for Paleolithic man, they maintain, was sufficiently advanced to recognize authority, although too ignorant to know how to chip his arrow or spearhead.

An implement very similar to this "baton of command" is used by the natives of Point Barrow, Alaska, as a chipping hammer; and as these European "batons" are commonly found associated with flakes, and at times with other chipped implements, it would appear preferable to class them as chipping tools rather than as insignia of rank.

If the tusks, teeth, and "batons of command" of the caves are of the pure stone age, as they undoubtedly appear to be, one may argue safely that primitive implements were employed in making them, unless it can be shown that primitive methods would not accomplish the work. That man learned early to perforate an eye in his needles is abundantly proven by the many examples found in the caves of Europe. Sir John Evans shows a bone needle from Kent's Cavern in England, with an eye neatly drilled through it, and refers to similar needles being found at La Madelaine, Les Eyzies, Laugerie Basse, Bruniquel, and the lower cave of Massat, associated with harpoons of the barbed type.¹

Sir John Lubbock calls attention to the fact that doubts were expressed as to whether these needles were of the stone age, but he says Professor Lartet removed these doubts by making a needle for himself by the aid of a flint.²

Implements of every period, of every race, of every country, show conclusively that man, from the earliest time of which we have any knowledge of him, has been an adept in the art of perforating. Whether the material to be perforated was skin, wood, bone, shell, ivory, or stone, the means to pierce them appear to have been forthcoming as soon as the necessity for doing so was felt.

The gravel beds of Europe have furnished fossils with holes in them, apparently made by artificial means, yet that these fossils were bored is doubted by some careful archæologists. The caves of Europe, which were occupied as dwellings or shelters by primitive races from the earliest period, all appear to furnish evidence that man, during the era when he fought with what is now an extinct fauna, possessed ability of no mean order in the art of drilling holes in hard substances.

Bored shells, bones, teeth, and the horns of deer, as well as the bones

¹ John Evans, "Ancient Stone Implements of Great Britain," New York, 1872, p. 161.

² "Prehistoric Times," New York, 1878, p. 561.

of fishes and plates of ivory, are found in the same cave layers with the bones of the mammoth, rhinoceros, hyena, and cave bear and the so-called paleolithic implements of the Madelaine, Chelles, St. Acheul, and Moustier type. This facility in perforating hard substances appears to have changed but little through succeeding ages from the earliest of which we have knowledge, and even to-day, if we eliminate the use of the diamond, it has advanced but little, if any, except in the velocity which may be imparted to the tool.

The shell-heap people of Denmark and the lake dwellers of the continent show apparently the same mechanical ability as their predecessors, not better and not worse. The Egyptians, Assyrians, Phœnicians, Greeks, Romans, and Britons all appear to have been equally ready with the boring tool.

The grottoes of Baousse Rousse, near Mentone, furnished 857 perforated beads and 26 perforated fish vertebræ—conclusive evidence of the ability of the inhabitants of the shores of the Mediterranean to bore hard substances.¹

The use of beads was common to the tribes not only of the American continent but to primitive people of all ages and all countries; whether they were made of chalk, as those found in the drift of Europe, or shell, as the beads of a large part of the world, or of glass, as the beads from very ancient burials, they appear to have been equally attractive to primitive races.

While, as before stated, the cave men of Europe were quite skillful with the drill in boring bone, shell, and ivory, an art in which their successors were no less accomplished, an English writer refers to a specimen which, as he asserts, helps to bridge the gap between paleolithic and neolithic implements, in the point of which there was a soft spot through which a hole has been somewhat irregularly drilled.²

In referring to bored objects, the writer meets with difficulty in selecting specimens, where there are so many to choose from as are found in the collection of the U. S. National Museum. Those here described were selected as being such as would best illustrate some type or material, and they range from those in softest wood to others of the most obdurate stone known to mineralogists. These perforations are executed with such accuracy and skill as to cause remark in this nineteenth century. The means employed have been by many declared to be inexplicable. Numerous theories have been advanced to account for the methods by which the work was accomplished.

The writer, in his experiments made at the National Museum during several winters, has found few kinds of work which have been performed by ancient races that present any serious difficulty of explanation by means of the implements which they are known to have possessed. The habit of attributing great patience and indomitable

¹ D'Acy, *Extrait de la Question Scientifique*, October, 1894, p. 21.

² W. J. Lewis Abbott, "Plateau Man in Kent," *Natural Science*, IV, No. 26, p. 266.

will to savages who have performed some work, which does not at first sight appear explicable by simple methods, is due rather to poetic fancy than to a willingness to admit ignorance. When we see bones or stones which have been perforated and cut, it is reasonable to insist that wood was cut and bored also. In the caves of the world, in the rock shelters, in the gravel beds, and in the older shell-heaps, with rare exceptions, all articles of wood would be destroyed in comparatively few years; yet we have evidence sufficient from which it may be argued that wood was worked as well as harder material. In the bogs and clays of Europe there have been found wooden boats in sufficient numbers to demonstrate that early in the bronze if not in the stone period man was an experienced worker of wood. The lake settlements have also offered convincing proof that wood was an article extensively worked by all ancient races, and the few specimens possessed by museums and private collectors show that wood has been bored, pinned, and sawed since the remotest time.

In the aboriginal graves of California articles of wood with holes bored through them were also found.¹

The natives of Alaska, in making their walrus-ivory pipes, show familiarity with the methods of boring, and employ the dowel as a means of attaching the bowl to the stem—a necessary process, because the size of the walrus tusk is not sufficient to admit of bowl and stem being made in one piece. The dowel presented the simplest solution of the difficulty which it was necessary to overcome, and consequently was adopted generally, although in this work the dovetail was sometimes employed to accomplish the same results. A careful examination of the records and collections gives convincing evidence that there are few things which at one time or another were not perforated either for purposes of suspension or as a requisite of the article.

Carver, speaking of the natives of Wisconsin, among whom he traveled about 1766, says: "They bore their noses and wear in them pendants of different sorts. I observed that sea shells were much worn by those of the interior parts and reckoned very ornamental, but how they procured them I could not learn; probably by their traffic with other nations nearer the sea."²

Rare objects, such as sea shells, must be great curiosities to interior tribes living far away from the ocean, and the practice of wearing them has been noted in many parts of the world. Ewbank refers to two Mojave necklaces of sea shells.³

The American Indian was as fond of his necklace, made from the teeth of elk, or bear claws or teeth, as was the cave dweller, or as the native of the interior of Africa is to-day of his necklace of lion or leopard

¹ C. C. Abbott, in Report upon United States Geographical Surveys West of the One Hundredth Meridian, VII—Archæology, p. 123.

² Carver, "Travels in Wisconsin," Philadelphia, p. 145.

³ Thomas Ewbank, Pacific Railroad Reports, III, p. 53.

ards' teeth. C. C. Jones speaks of beads of shells, of clay, and of bone, and says that those made of soapstone are globular in shape and about three-quarters of an inch in diameter.¹

The two shells here shown (figs. 1 and 2) are from Tennessee graves and are of the common shape of stone or glass beads. One of these shows the ordinary method of boring shell. While there may be some few instances of boring objects from one side only, the very general practice was to bore as represented in fig. 2, which has been done with a solid drill, one-half approximately of the work performed from either side.

Wampum, told of in song and story, is a name more familiar to the average citizen than any other one word in all the Indian languages of the American continent. Loskiel says that wampum, before the discovery of the country by Europeans, was made of wood which was colored black and white, and that it was seldom made of shells, because of the time required to bore them, and because they were of an awkward appearance. The manufacture of wampum by the whites for trade purposes, he says, caused the abandonment of wood for the neater articles of shells, which were obtained on the New England and Virginia coasts and were of different colors and values, black and white,—the former as valuable again as the latter.



Fig. 1.

TYPICAL SHELL BEAD.

Georgia.

Cat. No. 113766, U. S. N. M.



Fig. 2.

SECTION OF TYPICAL SHELL BEAD.

United States.

They were first made square and were then rubbed round or oval on a stone. These objects being strung were called a string, and two strings side by side were known as a belt of wampum. These belts were at times 3 or 4 inches wide, according to the nature of the subject discussed. There are both strings and belts used to talk from and to remind one of business transactions.²

Lindstrum, writing of the Indians of New Sweden, says: "Their money is made of shells—white, black, and red—and worked into beads neatly turned and smoothed. One person can not make more in a day than the value of 5 or 6 stiver."³

Father Boscana says of the California Indians: "They formed money from shells, which passed current among them."⁴ The later Indians, however, by no means confined their use of shells to the manufacture of money, for there is in the New York Museum of Natural History a magnificent collection of perforated shells from California, some of which are carefully bored, while others merely have holes broken through them. Again, there are shells which are carefully bored from side to side, an operation requiring some delicacy of manipulation;

¹ C. C. Jones, "Antiquities of the Southern Indians," New York, 1873, p. 519.

² Georg Heinrich Loskiel, "Geschichte der Evangelischer Brüder in Nord-Amerika," Barby, 1789, p. 34.

³ Second Ann. Rep. Bureau of Ethnology, p. 236.

⁴ Friar Geronimo Boscana, "Chinigchinich," New York, 1846.

there are fishhooks and rings, as well as disks, some of the latter having been bored a distance of two inches through their diameter, as are the runtees; and as these disks are slightly curved it has erroneously been supposed that the boring is also curved.

Schoolcraft says of wampum that "it appears from the Dutch records at Albany that three purple beads of wampum, or seawan, or six of white were equal to a styver among the Dutch, or a penny among the English. Some variations existed, however, in its value, according to time and place."¹

Fig. 3, a shell bead from an Indian grave in Mississippi, is of natural size, and appears to be a form of bead commonly met with in North American graves, although they vary considerably in size. Beads are found at times in large numbers, and are probably of a period subsequent to the advent of the whites on the continent. Schoolcraft also informs us that purple wampum "was made from the interior portions of the *Venus mercenaria*, or common conch shell. The white was wrought out of the pillar of the periwinkle.

Each kind was converted into a kind of bead by being rounded and perforated, so as to admit of being strung on a fiber of deer's sinew."²

Morgan, on the other hand, tells us that wampum was made of spiral fresh-water shells. Hubbard, whom he quotes, agrees with Loskiel and Carver, and says "it was first known in New England as wampumpeag, and the art of making it was acquired from the Dutch, according to Hutchinson, about 1620."³

Lawson says of wampum: "This the Indians grind on stones and other things until they make it current, but the drilling is the most difficult to the Englishmen, which the Indians manage with a nail stuck in a cane or reed. Thus they roll it continually on their thighs with their right hand, holding the bit of shell with their left, so in time they drill a hole quite through it, which is a very tedious work."⁴

Pickering says that "money was certainly known to the Hawaiians, for with a string of cowries (*Cypræa moneta*) it was possible to buy any article wanted. Specimens of the same shell that were finer than usual, having a high polish and a deep yellow color, were extravagantly valued, and could only be worn by the highest chiefs."⁵

Small, flat shell beads and beads made of stone, and bracelets of shell were found among the early Spanish races.⁶



Fig. 3.

TYPICAL SHELL BEAD.

United States.

Cat. No. 132360, U. S. N. M.

¹Henry R. Schoolcraft, "Notes on the Iroquois," Albany, 1847, p. 357.

²Ibid., p. 355.

³Schoolcraft, "League of the Iroquois," Rochester, 1851, p. 120, note. See also Baylies's "New Plymouth," p. 37.

⁴Lawson, "History of North Carolina," Raleigh. Reprint.

⁵Charles Pickering, "Races of Man," London, 1872, p. 89.

⁶G. and A. De Mortillet, *Musee Archæologique*.

Pearl beads appear to have been numerous and in common use among the American Indians at the coming of the white people, and are mentioned by most early travelers. Strings of beads and of pearls were used somewhat on the order of the quipus or knotted cords of the Peruvians, for Pickett says, "but when Milfort arrived among the Creeks, the old men exhibited strands of pearl which contained their history and constituted their archives. Upon their arrangement depended their signification; and only principal events were thus preserved. One of their chaplets sometimes related their history of thirty years."¹



Fig. 4.

BORED COLUMN OF SHELL FROM GRAVE.

North Carolina.

Cat. No. 175480, U. S. N. M.

The specimen shown in fig. 4 was sawed from the column of a Busycon shell from a North Carolina grave. It is over 6 inches in length and shows apparently how curves were bored. The hole through this shell, bored with a solid point part of the way from each end, can be seen. The date of these interesting objects is probably recent, and very likely they were bored by means of a solid metal drill used with emery sand.



Fig. 5.

IMITATION OF SHELL COLUMN, MADE OF NEPHRITE.

Tonala, Mexico.

Cat. No. 59971, U. S. N. M.

While ordinary quartz sand would in time cut the shell, the process would be much slower than would be the case were emery used. If emery was not used in boring this hole, the quartz sand employed must have been extremely fine.

The specimen illustrated in fig. 5 is nearly related to the preceding specimen, although it is of nephrite and was found at Tonalá, Mexico. It is in exact imitation of the ground column of Busycon in every respect, saving that this stone column is perfectly straight in its perforation, which is about one-sixth of an inch in diameter in the stone and is not over one-eighth of an inch in diameter in the shell. Nephrite is much harder than shell, and the specimen here given must have required several days' work to shape and complete it. The Mexicans early used "jewelers sand," probably emery, in their stonecutting and boring. This tube could be bored by means of a wooden shaft, though its small diameter would make a hole of the length of the specimen difficult to perforate, while with a metal point and emery the hole would progress rapidly.



Fig. 6.

BARREL-SHAPED OBJECT OF RED JASPER.

Mississippi.

Cat. No. 21902, U. S. N. M.

¹Albert James Pickett, "History of Alabama," Charleston, 1, 1851, p. 77.

Fig. 6 shows a small barrel-shaped bead of red jasper from Mississippi, of which there are several specimens in the collection of the U. S. National Museum. These stones are of a brilliant red color, almost vermilion, the shade of which makes it very attractive. All of them are small, and vary from the shape of a diminutive barrel to that of a disk. They have been carefully ground into shape and in some of them have been bored small holes not larger than one-sixteenth of an inch in

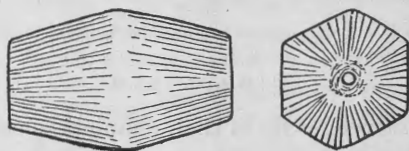


Fig. 7.

STONE BEAD.

Japan.

From a figure by Kanda.

diameter, with a depth, approximately, of one-eighth of an inch. Some of these stones have been bored nearly through, and as steel tools will not scratch them they must have been bored by means of corundum. It would be difficult to find a stone more obdurate in texture than that of the speci-

mens referred to, and for what purpose they were employed must, for the present at least, remain a matter of conjecture. In an attempt to bore one of these stones a highly tempered steel point worked in a patent drill was employed with emery, and the emery destroyed the steel point in ten minutes' work.

The fondness of man in his various cultural stages for beads has been noted all over the world; the graves of Japan, of Europe, of the early Californian and eastern American savage burials are often accompanied by a deposit of beads made of wood, stone, pottery, shell, or glass. "Glass beads similar to those found in the earliest Egyptian graves were found at Wauwyl,"¹ in Switzerland.

Figs. 7 and 8 are representations of beads and cylinders of stone from Japan, both of which were probably the beads of necklaces, and are known as Kudatama. They are made at times of crystal

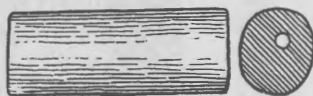


Fig. 8.

STONE CYLINDER.

Japan.

From a figure by Kanda.

or of jasper, stones which it is next to impossible to bore except by using emery, with the aid of which the work is by no means difficult.²

There are a number of cowry shells in the Abbott collection of Egyptian antiquities in the rooms of the New York Historical Society, which are said to be part of a necklace, which were probably bored, but it can not be positively said that they were, owing to the disintegration of their surfaces. Beads appear to be common to the whole world, to people of all periods and of every degree of civilization and savagery. Whether the bead be of wood, pottery, stone, shell, glass, metal, or pearl appears to depend more on the scarcity of the supply than on

¹ Keller, "Lake Dwellings," 1, p. 88.

² Cf. Kanda, "Notes on Ancient Stone Implements of Japan," Tokyo, 1884, pl. xvii, figs. 9, 10.

beauty, a peculiarity in which civilized races appear to share with their brethren of the stone age.

Beads of stone are met with at times in early American graves, as before stated, yet they are by no means so common as is the case in other countries. Of small, neatly ground and perforated stone beads there are a number in the Metropolitan Museum of Art in New York which were found in Cyprus. Professor Morse also calls attention to the stone beads, some long and cylindrical, others globular, which are found in Japan. The boring of these tubes is said to be done apparently from one side.¹ If this be correct, it is quite an unusual occurrence among bored objects made by primitive races.

Captain Cook says the women of the Sandwich Islands at the time of his visit wore bracelets of a single shell; pieces of black wood with ivory interspersed, neatly polished and fastened together by a string drawn closely through them; and that the natives adorned themselves with necklaces of bunches of small black cord to which they fixed a small piece of wood, stone, or shell well polished, and had necklaces of many strings of small shells.²

Glass beads have always been a favorite article of commerce with primitive people, their hardness and brilliancy of color being calculated to make them attractive to those to whom a bead of stone was an article of jewelry. Jones refers to a find of fifty-five Venetian beads, varying in shape and color—some red, blue, white, or green, with crimson and yellow horizontal stripes, and others black.³

A bead of rock crystal resembling a spindle was found in a Gallo-Roman burial place.⁴

John Smith calls attention to the fact that the natives of Virginia adorn themselves with copper beads,⁵ probably small tubes made by first battering the native copper into plates and subsequently making these plates into tubes by hammering on edge, a very simple method and one easily accomplished.

That perforations were not always bored may be seen in fig. 9, which is from a tumulus on Brading Downs, England, and is supposed to belong to the British period, i. e., to a time when the Romans began to colonize England. It is made from the basal portion of a red deer horn and has a hole cut through it one inch in diameter. The specimen is supposed to be a hammer of British make.⁶ Such implements are apparently not unusual in Europe, and are often found among the lake habitations. They are, so far as the writer is aware, almost always cut as shown in fig. 9 instead of being bored.

Schliemann speaks of finding what he designates as a lion-headed

¹ Edward S. Morse, "Shell Mounds of Omori."

² Cook, "A Voyage to the Pacific Ocean, 1776-1780," London, 1784.

³ Jones, "Southern Indians," p. 235.

⁴ Frederick Moreau, "Gallo-Roman Burial," pl. 78.

⁵ Smith's History of Virginia, p. 30.

⁶ John E. Price, Anthropological Institute of Great Britain and Ireland, XII, p. 194.

scepter handle of rock crystal with a "large hole in the lower side into which the staff was stuck, as well as a perforation on each side, which can leave no doubt of its use."¹

The bored tablets of Europe, the perforations in shells or stone beads, in the teeth of bears, in the horns of deer, or the scarabs of Egypt, and the bored cylinders of Assyria, composed often of the hardest stones with holes bored through them, varying in depth and diameter as much as American finds do, all testify to the antiquity of the knowledge of the drill in some form.



Fig. 9.

DEER HORN HAMMER, CUT.

England.

From an illustration in the *Journal of the Anthropological Institute of Great Britain and Ireland*, XII, p. 194.

It is known from the discoveries in the caves of Europe that whistles have been used by man since the earliest times, many specimens having been found all over the continent. These whistles

were usually made from one of the bones of a deer's foot, having a hole cut or bored through. Whistles made from the leg or wing bones of birds were found by Paul Schumacher in the California graves in considerable numbers.² They were made by sawing off the two ends of the bone and boring a small hole near one end and dropping through it a particle of bitumen. Many of these single-holed whistles have shrill notes and varying tones. Some of these objects were made into musical instruments by having been bored with as many as four or five holes, as seen in fig. 10.³

Fig. 11, drawn after Thruston, represents a steatite whistle 11½ inches long, plowed up in Warren County, Tenn.⁴ Were this the only evidence of whistles in the Eastern United States, doubt might be expressed of their being of purely American origin, but



Fig. 10.

BONE FIFE.

California.

From a figure by C. C. Abbott, *U. S. Geological Surveys west of the One Hundredth Meridian—Archæology*, 1879.
Cat. No. 20532, U. S. N. M.

there are several references by early writers of the Indians of the Atlantic Coast possessing flute-like instruments similar to those of California, which would appear to entitle them to the credit of being the product of Indian ingenuity, though the references are to musical instruments or flutes of reeds. That flutes, however, are by no means modern may be seen on the glyphs of Egypt, where figures are represented playing upon them.

¹Henry Schliemann, "Ilios," New York, p. 428.

²Report upon the United States Geological Surveys West of the One Hundredth Meridian, VII—Archæology, p. 235.

³Ibid., p. 237.

⁴Gates P. Thruston, "The Antiquities of Tennessee," Cincinnati, 1890, p. 283, fig. 190.

The specimen shown in fig. 12—one-half size—is said to be a stone flute, hollowed throughout and perforated in three places. It is made of black serpentine, highly ornamented, and inlaid with certain gold dots. Yet the implement belongs among the ancient stone tools of Japan.¹ The figure is taken from Kanda. This interesting flute is certainly artistic, and one could suppose it to be of comparative modern make, were they not informed to the contrary by such excellent authority.

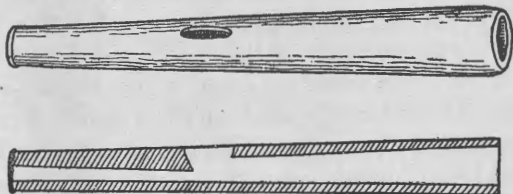


Fig. 11.
STEATITE WHISTLE.
Tennessee.
From a figure by Thurston.

The pipes, which are well authenticated as belonging to the age of stone in America, are

bored, at times with extreme care, the stems not infrequently having perforations five or six inches in length, with a diameter of over one-eighth of an inch. The bowls of early pipes appear to be quite small, increasing probably with the increased supply of tobacco grown

by the whites. The stone of which these pipes are made is selected, not only with a view to its suitability to the purposes for which it was intended, which was to resist destruction by heat, but there



Fig. 12.
STONE FLUTE.
Japan.

From a figure in Kanda's "Notes on Ancient Stone Implements of Japan."

is evidence of taste in color shown by these interesting objects. The shaping of these pipes, made at times of stones of great hardness, demonstrates the ability of the North American Indian to wield the carving tool with considerable skill, though apparently ignorant of a knowledge of sculpture.

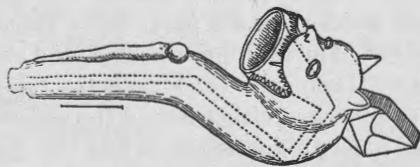


Fig. 13.
SIOUX CATLINITE PIPE.
Cat. No. 43278, U. S. N. M.

Fig. 13 is a spirited representation of a cougar holding an acorn-shaped bowl in his mouth. It is a pipe made from a block of catlinite by a Sioux chief, his only tools being a knife, with which the stone was cut, and a piece of wire by means of which it was bored. The specimen is reproduced one-half size and has a snake carved on the stem, crawling toward the bowl. The pipe had to be bored in four different directions, represented by dotted lines in the figure. Not being able to pierce the entire stem in any other way, a perforation

¹ T. Kanda, "Notes on Ancient Stone Implements of Japan," Tokyo, 1884, pl. xxxii, fig. 2.

has been made from the outside at the base of the stem, from which a hole was bored into the bowl, and a second one met the perforation which had been made from the mouthpiece of the stem, after which the hole in the base of the stem has been plugged with a plate of lead, neatly fitted into the stone, thus completing a continuous tube. One of the most striking features of this specimen is the cougar's head, with distended jaws, holding the bowl in his mouth. The idea was probably created purely in the brain of the maker and demonstrates how similar human nature is the world over, and in how similar a manner ideas will develop themselves among races the most widely separated. This artistic concept may be seen duplicated in the earliest art of South America, where the idea is developed with the alligator; or in Assyria, where the same

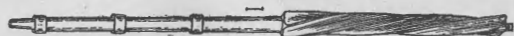


Fig. 14.

WOODEN PIPE STEM, BURNED OUT.

Ojibwa.

Cat. No. 130786, U. S. N. M.

fancy is expressed with the fish. With the head of a wild beast it appears amongst the Egyptians, the Phenicians, and the Greeks. With the latter,

the head of Hercules inclosed in the jaws of a lion in later periods gave way merely to the skin of the legs wrapped around the neck. The same principle is seen at times in the shoulder piece of an ancient French armor.

The pipe-stems of the American Indian were at times remarkably elaborated; they were carved with various ornamentations, and decorated with bright-colored feathers or beads, which, when stuck into a catlinite bowl, made them fantastic in their weird medley of color and adornment.

The early American pipe-stem and the blowgun used by the natives of Peru were similar in their general construction. The blowgun consisted of a palm wood staff 8 feet or more in length, tapering from an inch in its largest diameter to half an inch at the other extremity. This stem was split longitudinally and a canal was then hollowed out along the middle of each part; being reunited, the shaft was smoothed and polished by rubbing with fine sand and wood.¹ This was noticed on the river Maranon. The stem being thus shaped, the Indians of the southern continent either lashed the pieces together and ornamented them or they were glued together and then polished smooth again, obliterating entirely the marks of the split in the stem, which was readily done with pigments or could be accomplished by smoking. Three specimens of blowpipes, collected by Lientenants Herndon and Gibbon, are in the Museum collection.

Fig. 14 (Museum No. 130786) represents a modern Ojibwa pipe-stem, the hole being burned through a solid piece of wood instead of being bored, as many supposed. These stems are at times burned through a length of 3 feet. From old specimens in the U. S. National Museum

¹Herndon, "Exploration of the Valley of the Amazon," 1, p. 138.

collection it is judged that prior to the advent of Europeans pipe-stems were made from split pieces of wood treated as above described.

Fig. 15 represents a wooden pipe-stem of Siouan origin. A cursory examination of it would not suggest the method by which it was made. The stem is hollowed throughout its entire length, passing along the dotted line in the illustration, which hollowing in the specimen can not,

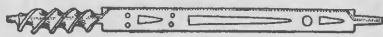


Fig. 15.

SIoux WOODEN PIPE STEM, GOUGED AND BURNED.

Deposited in the U. S. National Museum by Maj. J. H. Bell.

however, be detected upon the exterior. The perforations of this stem, which is drawn one-third actual size, have been burned for a certain distance from either end, then a strip as thin as veneering was removed along one edge of the stem. Near the shoulder at each end holes were burned in to meet the holes from the extremities, and between these latter points a shallow groove or canal was rudely scraped, just as we are informed the native of the Amazon scraped his blowpipe; and then the strip was glued back into its original position and the wood was painted. Several

of these stems were carefully scrutinized without detecting the manner in which they were made. The difficulty was finally solved when a specimen was found in which it was noticed that the veneering had cracked slightly,



Fig. 16.

WALRUS IVORY PIPE STEM (EXTERIOR).

Norton Sound, Alaska.

Cat. No. 33222, U. S. N. M.

which unfolded the whole process of the work. Until the cracked specimen was discovered, it looked very much as though the Indian had bored a hole around the several openings which are shown in the illustration.

Figs. 16 and 17 represent a walrus ivory pipe-stem from Norton Sound, Alaska, showing the outside of the stem as well as its interior finish, which is extremely peculiar, in that the stem has been bored only about $1\frac{1}{2}$ inches from the smaller end and one-fourth of an inch from the larger end. Then along the back of the stem between these points twenty or thirty one-eighth inch holes have been bored nearly through the tusk, after which the ivory remaining



Fig. 17.

WALRUS IVORY PIPE STEM (INTERIOR).

Norton Sound, Alaska.

Cat. No. 33222, U. S. N. M.

between the drill holes has been cut out, leaving a deep canal, which it was intended to close with a tightly fitting plate let into the ivory, as is often the case with wooden pipes from Alaska. The bowls of walrus ivory pipes of this class were made of bone, stone, or metal. The size of the walrus tusk, however, was such as precluded the possibility of the

bowl and stem being of the same tusk, which necessitated a different material being substituted. While, as above stated, bowls of bone or ivory were at times used on these pipes, their odor in smoking was so offensive that even the olfactories of an Eskimo could not stand it; consequently bone bowls are not common. The attachment of these bowls to the ivory naturally presented difficulties, which were solved by these ingenious people by mortising the square base of a bowl into the stem by dovetailing, or by using dowels through the base and into the stem, which were held in position by means of the pins.

The use of the dowel dates far back into the past, and has been employed by the Egyptians from an early period of their history.

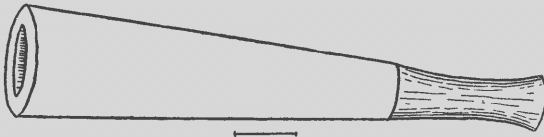


Fig. 18.

HUPA PIPE OF WOOD AND STONE.

California.

Cat. No. 131157, U. S. N. M.

There are in the collection of Egyptian antiquities in the rooms of the Historical Society in New York a number of wooden spoons representing human figures, and also those of animals with limbs

outstretched as though swimming, the bowls of which are attached to the handles by dowels neatly fitted into the bodies, showing that bowls and handles were separately made. The dowel holes of these spoons were apparently bored by means of metal points.

Fig. 18 shows a pipe, made by the Hupa Indians of California, of serpentine and wood as neatly shouldered as could be done with the most elaborate modern tools. The longitudinal section (fig. 19) shows

the bowl and mouthpiece, the former of stone and the latter of wood; the relative proportion, however, of stone to wood in pipes of this class varies greatly—from nine-tenths wood in certain specimens to all stone in others.



Fig. 19.

SECTIONAL VIEW OF HUPA PIPE.

While at present the mouthpieces of pipes of this class are almost invariably of wood, those from the graves along the California coast were generally of bird bone where not of stone. Where the mouthpieces were of bird bone, they were held in place by asphaltum, while modern specimens are glued in. These pipes are cylindrical tubular, decreasing in size from the bowl to the mouthpiece and vary in length from 3 to 10 inches or more, and were usually made of steatite or of serpentine, stones well suited to withstand heat. Pipes somewhat similar to those of California have been found in the stone graves of Tennessee. The bowls of these pipes have usually been bored with solid points of large size; the stems were bored with drills of small size, possibly of metal. Pipes of similar shape to these, made of burned clay, are found in many places in this country.

Referring to the manufacture of pipes, Hunter says that the "Indians made pipes which are excavated by means of friction with harder substances and the intervention of sand and water."¹ There can be little doubt that copper beaten into fine points has from an early period been employed for perforating holes in various materials. Of the Virginia Indians it was said "their pipes were made artificially as ours are, but far bigger, with the bowl fashioned together with a piece of fine copper."²

In fig. 20 a Tennessee tube made of micaceous schist is shown. It was hollowed out with solid drills of different sizes, and the holes were subsequently enlarged by scraping or gouging the long axis of the specimen.

The fondness for perforated teeth of wild animals as ornaments, appears universal among all hunting peoples. There is in the U. S. National Museum the dress of a Sioux woman upon which are sewed upward of two hundred bored elk teeth, and when it is remembered that an elk only furnishes two such teeth it will be seen that such a possession would naturally be of interest among a people whose very existence depended upon the returns of the hunt.

The American Indian prizes highly his necklace of bored grizzly bear claws, taken from an animal which he has killed, as it is the stamp of his courage, just as the tail feathers of a bald eagle, which have been taken from the live bird, are considered evidences of patience and skill. Bored teeth and claws of the bear are used for necklaces throughout the American continent. Bear teeth commonly furnish hand pieces for the strap drill, and throughout Arctic America are also used on the lines of sleds as handles to pull by. The teeth of lions and leopards are highly prized by the negroes of the interior of Africa, and are worn as necklaces from the same motives which actuated the primitive man. They were visible emblems of personal bravery; objects of envy not only to savages but at times even to civilized man. The jaw teeth of monkeys are used by the natives of South America in the same manner. "In the ancient lake village in the peat moss of Moosseedorf, in Switzerland, there have been found upward of three thousand specimens, mostly of stones and not a trace of metal, yet even here were found eight perforated boar's teeth and two perforated bear teeth."³

Pearls with artificial perforations were worn in strings by the natives, and attracted the attention of Columbus and the Spaniards as early as

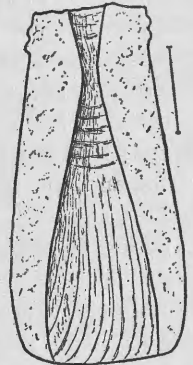


Fig. 20.

TUBE OF MICACEOUS
SCHIST.

Tennessee.

Cat. No. 20114, U. S. N. M.

¹Hunter, "Manners and Customs of the Several Indian Tribes Located West of the Mississippi," etc., 1823, p. 209.

²John Smith's Works, Arber's reprint, referring to Hon. George Percy, pl. iv.

³Sir John Lubbock, "Prehistoric Times," p. 13.

1498.¹ These perforations, according to the Spaniards, were made by the Indians with heated copper spindles.²

They appear common among the relics of early races throughout a large portion of the southern part of the United States, and two perforated pearl beads were found in a grave on San Miguel Island, California.³ The Portuguese report of De Soto's expedition also makes the statement that pearls were perforated by means of heated copper.⁴

Ornament, color, rarity, but particularly beauty in art or nature is equally attractive to the savage and to the civilized man. Beads are found of every imaginable material capable of being perforated. Adair says of shell money: "They made great quantities of wampum of the conch shell by rubbing them on hard stones, and so they formed them to their liking. It is first chipped to the proper size, then drilled, and afterwards ground to a round, smooth surface and polished."⁵

Articles made of bored wood must have been in daily use wherever articles of harder material were used, examples of such articles having been found in graves in California.⁶

Explorations of the shell heaps, of the dolmens, of the lake dwellings of Europe, and even the most ancient part of the ruins of Troy, from 42 to 52 feet below the surface, afford us a type of bored tool of unusual interest. It is the familiar ax hammer, or the Thor hammer of northern Europe; its rudest form is not unlike the sledge hammer of our blacksmiths, and was probably employed from its earliest date as a heavy crushing hammer. The earliest form of this tool is graceful, yet during the period of bronze the shape and the ornamentation of this article clearly indicate that it is an implement copied from bronze types, although the bronze itself was, during an earlier period, a copy of a stone original. This evolution of the sledge hammer has been one of the most striking examples of the survival of primitive forms. Whether the ax hammer was made from stone, copper, bronze, iron, or steel, its purpose, its use, and its shape have varied but little. Implements of this class are invariably intended to be perforated. If they were of metal, their eyes would naturally be cast, for savage or civilized man knew the value of labor, and would certainly never have undertaken to perforate an eye in metal which was cast. Where, however, the implement was of stone, its artificial perforation became a necessity. The stone of which these ax hammers or sledges were made, was diorite, porphyry, gneiss, blue serpentine, gabbro rock, etc., according to Schliemann.⁷

¹ Conway Robinson, "Early Voyages to America," Richmond, 1848, p. 96.

² C. C. Jones, "Southern Indians," p. 292.

³ Second Ann. Rep. Bureau of Ethnology, p. 226.

⁴ Thruston, "Antiquities of Tennessee," p. 299.

⁵ Jones, "Southern Indians," pp. 504-505.

⁶ Report upon the United States Geographical Surveys West of the One Hundredth Meridian, VII—Archæology, p. 123.

⁷ Henry Schliemann, "Ilios," New York, p. 244.

These hammers would seldom, if ever, be made of flint, for if of flint, and they were perforated, they would be nearly useless as hammers, whereas hammers made of the tougher minerals would stand an unusual amount of battering on the hardest substances. Ax-hammer holes were made in several ways. A specimen of blue serpentine from Troy (fig. 21) is in the U. S. National Museum collection—a donation of Mrs. Schliemann. It has a hole picked nearly through it by means of a sharp-pointed tool. Other specimens have been bored by means of a solid drill point, as is seen in fig. 22, a Danish specimen. Yet others have evidently been bored by means of tubular drills, as observed in the specimen shown in fig. 23, which is from Lake Constance, Switzerland. Some of the holes are bored with the utmost accuracy; others, again, are irregular in shape. The means adopted to bore these interesting implements have

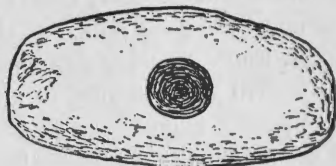


Fig. 21.
STONE AX-HAMMER, PECKED.
Asia Minor.
Cat. No. 149757, U. S. N. M.

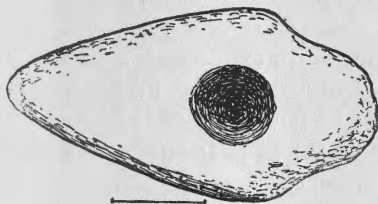


Fig. 22.
DANISH STONE AX-HAMMER, SOLID POINT.
Cat. No. 101079, U. S. N. M.

given rise to some controversies, certain authors contending that they belong to the metal age and that they were necessarily bored with metal drills; others contending that they were of the stone age and were bored by means of bone or horn tubes. Each side advances arguments to sustain their assertions, and beyond doubt the implement could be and was perforated

in different ways. Where metal was available it was probably used, but where there was no metal, the same object could be accomplished with equal facility by a wooden staff, or one of reed, the one requiring very little more time than the other.

The excavations of Egypt, Assyria, and Phenicia bring to light evidences of such skill with the drill in boring minerals of the hardest kind as to lead the well-known Egyptian explorer and savant, Prof. Flinders Petrie, to claim that the Egyptian workman was possessed, not alone of the diamond drill, such as is at present employed, but that he possessed a drill having diamonds set in the interior of the tube as well as on its exterior.

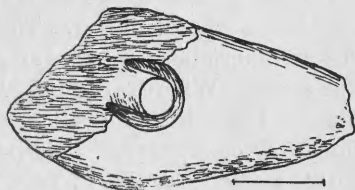


Fig. 23.
STONE AX-HAMMER.
Lake Constance, Switzerland.
Cat. No. 100672, U. S. N. M.

This distinguished authority, whose opinions are entitled to the most careful consideration, knowing, as he probably does, better than anyone

else the technical ability of the Egyptian of antiquity, claims that these drills were worked under a pressure of two or three tons, which would have been sufficient to destroy any tube used at its first revolution. Under such pressure any jewels which may have been set in the drill tubes would certainly have been torn from their settings as soon as they touched the hard rock.

M. Emile Soldi states that the work could be accomplished by the bow drill with the aid of emery, but says there are no paintings or sculptures among Egyptian antiquities showing the use of the drill. Perforations as much as five inches in diameter found in stones in Egypt, it is submitted, could not be managed by the bow drill, except upon an unnecessarily small scale, but the perforation could be and probably was made by means of the monumental disk drill of Egypt, which is represented on monuments dating from the fourth to the twenty-fifth dynasty. No figure is more prominent among Egyptian antiquities than the drill.

Carnelian and semiopal have been bored in Arabia Petræa since an early period, and have been carefully polished and often perforated with holes no bigger than would be made by a hog bristle.

The cylinders, seals, and scarabs, of Assyria, or of Egypt, with perforations of no larger diameter than one-eighth of an inch, accurately cut through stones as hard as crystallized quartz, are calculated to persuade one not familiar with the methods of boring stones adopted by early races, that Professor Petrie may be right as to the use of the bow in this instance. The ax-hammer holes, often three-fourths of an inch in diameter, found throughout most of Europe and a large part of Asia, and occurring in the shell heaps of Denmark, where no metal was found, and in the lake dwellings of the pure stone age in Switzerland, appear to sustain the view that these tools belong to the pure stone age. It may be said that an individual capable of shaping the articles in question would certainly work with that tool which experiment demonstrates was the one with which a given work could be most easily accomplished.

Professor Nilsson says: "We meet with stone axes of basalt or diorite bored with the centerbit. They are never found in gallery graves or in our oldest bogs. I consider them as belonging most likely to the iron age."¹ Whereas Sir John Lubbock says, "It is doubtful if hatchets of stone bored through belonged to the age of stone; they are generally found in bronze graves."² Yet, showing what differences of opinion exist in this matter, Prof. E. B. Tylor considers "ax-hammers that are bored as typical of the highest European stone age."³

J. C. Southall takes a conservative position and says: "It is perfectly true that no metal occurred at Wangen, Moosseedorf, Nussdorf, or Wauwyl. Perforated celts, however, did occur (fifty at Wangen). This

¹ Nilsson, "Primitive Inhabitants of Scandinavia," pp. 79-80.

² Lubbock, "Prehistoric Times," p. 98.

³ E. B. Tylor, "Early History of Mankind," p. 203.

may fairly be called the stone age, although even here we get upon the trail of metal, and recognize plain evidence of some sort of contact with the East."¹

Sir John Evans, whose work on ancient British stone implements deservedly holds a front rank among books on archæology, and whose opinion is deserving of the highest consideration, says of this implement: "It seems almost indisputable that these elegantly formed ax-hammers belong to a period when bronze was in use. That the perforated form of ax was of later invention than the solid stone hatchet is almost self-evident. Of the external shaping of stone axes but little can be said. They appear in some cases to have been wrought into shape by means of a pick or chisel and subsequently ground; in other cases to have been fashioned almost exclusively by grinding."² Yet Southall again says: "The beautiful perforated stone axes have also been found in the Dolmens of Brittany which, unquestionably it appears to us, must have been worked with iron or bronze."³ Two of these bored hammer stones were found by Schliemann in the oldest city of Troy. They were found in the second city, also in the third or burned city, and the same implement, but of bronze and double bladed, was found in the sixth or Lydian city.⁴

The opinions of these archæologists are clearly at variance as to the age of the ax-hammer and their expressed opinions are irreconcilable one with the other. The ax-hammer is found in England, France, Germany, Scandinavia, Italy, Greece, and Asia Minor; and is, judging from the evidence submitted, common in the stone age, equally so in the age of copper or bronze, and on into the period in which iron and steel is in daily use. The stone mason's hammer and the blacksmith's sledge-hammer are essentially the same implement. Its history is undoubtedly ancient, and although it was first made of stone, then of bronze, then of iron, and now of steel, its function has always been to give hard blows, and we may well imagine Vulcan forging the armor of Achilles with a tool of this character. The cores from these hammers, which Nilsson, Evans, and Southall appear to think are produced by the use of a metal tube, can be and are shaped by means of a reed or bamboo as well as could be done with metal. In Evans's "Ancient British Stone Implements" there are a number of excellent illustrations of the ax hammer, some of which are so plain as to indicate a low stage of mechanical development in their makers, yet many of them are so carefully finished that the tool marks by which they were shaped are obliterated; others having been less carefully ground show certain hammer marks not entirely ground out, while other specimens show only indistinctly the marks of the shaping tool or the commencement of the grind-

¹ J. C. Southall, "Recent Origin of Man," Philadelphia, 1880, p. 106.

² Sir John Evans, "Ancient Stone Implements of Great Britain," pp. 48, 176, 192,

³ J. C. Southall, "Recent Origin of Man," p. 156.

⁴ Henry Schliemann, "Ilios," preface, p. XII, and pp. 438, 439, 606,

ing process. Among these implements there are some so obviously copied from metal originals which were cast, that there remains no doubt of their belonging to the metal age. Ax-hammers do not appear to be found in Spain.

Fig. 24 shows a depression bored in a piece of marble in fifteen minutes, to a depth of three-eighths of an inch, by means of a pump drill and sand and water, and a hollow cylinder of mercantile copper. The drill stock was a broomstick; the disk, an African digging-stick weight, weighing nearly five pounds. The shaft was three feet long and had to be worked with both hands, making an extremely awkward implement because of its unnecessary weight. Plates of limestone one-fourth of an inch thick were bored by means of the straight shaft drill or the bow drill in from two to three minutes with stone or metal points.

Perforated objects are peculiar to no particular time or place, but are common to the whole world. Such things in the two Americas, when the perforation exceeds a diameter of $1\frac{1}{2}$ inches, will generally be found to have been pecked through, and not drilled, as the work can be accomplished in less time than with the ordinary drill.

The "stone hammers," as ax hammers are called by Wilson, are said to be common in the older Scottish cists.¹ A perforated stone hammer was found under a stone cairn on the farm of Glenhead, near Doune, Scotland, which was two and one-half inches in length.²

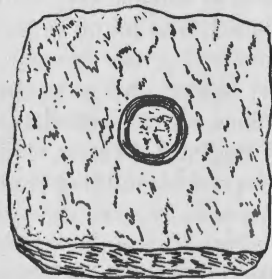


Fig. 24.

TUBULAR PERFORATION IN MARBLE.

Cat. No. 166100, U. S. N. M.

Mr. Frazer calls attention to one of two micaceous sandstone perforated hammers of considerable hardness, which were found

in a field where there had been found a stone mold for making bronze or copper celts.³ Signor Belucci gives a plate of one of these axes, which is peculiar, in that it has an eye, and is also grooved above the eye.⁴ This implement is very similar to a specimen found by Schliemann in the third city of Troy, the only difference being that the Umbrian specimen is a completed tool, whereas the Trojan hammer-ax is unfinished, the eye having been started with a heavy tubular drill, apparently made of wood, the implement being green gabbro.⁵

Ax hammers are found in Austro-Hungary, and are bored with both tubular and solid drills,⁶ and none are better made or show greater

¹ Daniel Wilson, "Prehistoric Annals of Scotland," London and Cambridge, 1863.

² Proceedings of the Society of Antiquaries of Scotland, 1882-83, p. 453.

³ William Frazer, Journal of the Historical and Archaeological Association of Ireland, October, 1889.

⁴ Guiseppi Belucci, "Materiali Paleontologici Della Provincia dell' Umbria," pl. 10.

⁵ "Ilios," p. 439, fig. 624.

⁶ Kunstliche Atlas.

variety of shape than do those of Sweden.¹ The Caucasus has also furnished Thor hammers of diorite.²

The Trojan ax-hammers appear to have been bored in different ways. There are in the U. S. National Museum three of these implements, of blue serpentine and diorite. They were presented by Mrs. Schlie-mann. One is bored by means of a tube, a second is started with a solid drill point, whereas the third is "picked" out from either side to a considerable depth.

The metal ax hammer we find represented on the ancient coins of Asia as early, certainly, as 400 to 336 B. C., during the age of the Spartan and Theban supremacy. Tenedos appears to have coined silver money of this type at three different epochs: first, in the early period before the Persian wars on the Babylonian standard; second, about the time of Alexander the Great on the Phenician standard; and third, about B. C. 189 on the Attic standard.³

In fig. 25 is shown a broken ax-hammer from Lake Constance, Switzerland, which has been bored with a tubular drill, the tit in the bottom of the hole being caused by the drill point being choked with sand.

The original of the cast of the so-called oval of Sargon, the original of which is the oldest inscribed object in the British Museum, is a small, egg-shaped piece of veined marble, pierced lengthwise. "It was discovered by Mr. Hormuzd Rassam at Abou Habba, the Babylonian Sippar (in the Bible, Sepharvaim), a city from which the King of Assyria transported colonists to Samaria.

The inscription reads, 'I, Sargon, the King of the city, King of Agade, have dedicated this to the sun god (Samas) of Sippar.' This king is supposed to have reigned about 3800 B. C., and this is undoubtedly a contemporary document. The date is derived from a statement on the cylinder of Nabonidus, the last King of Babylon (555 to 538 B. C.). The father of Belshazzar records that when rebuilding the temple of the sun god he found the original foundation stone of Naramsin, Sargon's son, which none of his predecessors for three thousand two hundred years had seen. Agade, mentioned on the oval of Sargon, is Akkad, enumerated in the genealogical tablet, Genesis x, 10, as one of the four cities of Nimrod's Empire. Akkad was also the name of the entire district of North Babylonia." (See Proceedings of the Society of Biblical Archæology, VI, p. 68, VII, p. 66, VIII, p. 243.)⁴

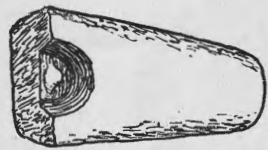


Fig. 25.

BROKEN AX-HAMMER, SHOWING
TUBULAR DRILL HOLE.

Lake Constance, Switzerland.

Cat No. 100675, U. S. N. M.

¹ Oscar Montelius, "Die Kultur Schwedens vorshritlicher Zeit," Berlin, 1885, pp. 15-23.

² Ernest Chantre, "Recherches Anthropologiques dans le Caucase," Paris, 1885, I, p. 49, fig. 4.

³ Barclay V. Head, "Coins of the Ancients," London, 1881, pl. 18, fig. 20.

⁴ Label in the U. S. National Museum.

This dedication of implements does not appear to be uncommon to the ancients, and we see among the antiquities of Egypt clubs with dedications upon them. Egg-shaped balls of the general character of the oval of Sargon, with drill holes three-eighths of an inch bored through their greatest diameter, have been found in Cyprus, and several are in the collection of the Metropolitan Museum of Art in New York, which appear peculiarly adapted for mace heads and are scarcely so well suited for any other purpose. These balls are carefully finished and are about 3 inches in diameter; the holes are sharply cut, with the interior so smooth as to indicate that they were bored with metal tubes and very fine sand, although a wooden shaft could be made to do the work equally as well as would metal. Schliemann describes similar stone balls from Troy.¹

Fig. 26 shows a stone ball broader in proportion to its height than are the stone balls of Cyprus, yet these latter are spherical, while the oval of Sargon is egg-shaped. Each was probably used as a club head and was intended to be employed as a weapon. Exactly such an implement was so employed by the Fiji Islanders, of which there is a mounted specimen in the U. S. National Museum collection, so placed on the club as to leave no doubt as to its employment. The specimen illustrated is a close-grained granitic schist from Santa Rosa Island, California, bored by means of one of the St. Miguel plummet drill points (fig. 78). A majority of these club heads in the collection of the Natural

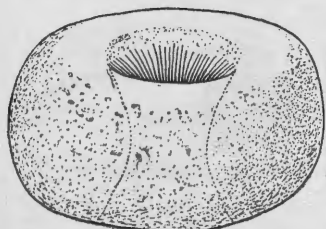


Fig. 26.

PERFORATED STONE BALL.

Santa Rosa Island, California.

Cat. No. 12154, U. S. N. M.

History Museum of New York City are made of serpentine, yet scoriæ and coral were at times employed. In the New York collection are found specimens in all degrees of completeness and of many sizes, from those weighing ounces to those weighing pounds. These objects, according to Henry W. Henshaw, were declared by Indians who professed to have worked with them, to be digging-stick weights.²

The perforation in the specimen figured varies from three-fourths of an inch to $1\frac{3}{4}$ inches in diameter, whereas the greatest diameter of the stone is only $2\frac{1}{2}$ inches by $1\frac{3}{4}$ inches in height, which seems too small to be considered as a digging-stick weight, such as the larger specimens probably were. Mr. Henshaw says it was explained that the smaller specimens were intended for children's use.³

Dr. O. C. Abbott speaks of these implements being found in various parts of the world, and "their uses being problematical. "They have,"

¹ "Ilios," p. 442.

² Henry W. Henshaw, "Perforated Stones from California," p. 8.

³ *Ibid.*, p. 8.

he says, "been classed as hammer stones, digging-stick weights, net sinkers, and spindle whorls."¹

It is a well-known fact that the North American Indian employed his implements for all the purposes for which they were serviceable, as does civilized man. The South Africans used a perforated stone of spherical shape five inches or more in diameter, which weighed as much as five or six pounds, for weights for the digging stick. These weights, much heavier than those from California, are only suited for such work, for, as club heads or disks, they are too heavy for use, and if so employed would, in a few minutes, tire out the strongest man. Two mace heads, similar to those from Cyprus, of a brownish-colored stone, are among the Babylonian relics in the Museum of the University of Pennsylvania. These objects are widely diffused over Asia, Africa, and America, and are often made with extreme caré.

There are found in many parts of the United States certain stones of discoidal form which have perforations partially or entirely through them; they vary from two to six inches in diameter and from one to two inches in thickness. The perforations in these stones are variously explained, yet none of the explanations appear satisfactory. The objects referred to are called "chunkee" stones, said to be the implement with which a game was played by the Indians. These stones, however, were probably perforated by pecking and subsequent grinding, which wore down the rough surface left by the hammer.

Cylinders of stone were first used by the inhabitants of Mesopotamia. There were pyramids, spheroids, and especially cones, say Perrot and Chipiez, and almost every cone was pierced near its summit (fig. 27). These latter became almost universal in the time of the Seleucidæ and the Parthians.²

The original of the illustration is of agate. In fig. 28 is shown a stone cylinder perforated longitudinally, the original of which is from Assyria, and is made of hematite. They were used by the Assyrians from a very early period as seals, being engraved in intaglio, with which an impression on a surface of clay could be made merely by rolling the cylinder over and slightly pressing on it at the same time. The holes drilled in cylinders vary from one-sixth to one-eighth of an inch in diameter, and invariably appear to have been countersunk before the boring was begun. This boring was probably done with emery, of which there was an abundance in the Grecian archipelago. These cylinders appear to have been engraved with a round point

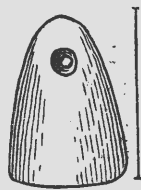


Fig. 27.

ASSYRIAN CONICAL SEAL.

Height, $\frac{7}{8}$ in.; diameter of base, $\frac{5}{8}$ in.

From a specimen in the U. S. National Museum.

¹Report upon United States Geographical Surveys West of the One Hundredth Meridian, VII—Archæology, 1879, p. 166.

²Perrot and Chipiez, "A History of Art in Chaldea and Assyria," New York, 1884, II, p. 277.

and a wheel. The earliest specimens of Assyrian seals date from 2000 to 600 B. C. Cylinders are made of various minerals, the earliest probably of steatite, serpentine, and finally hematite, carnelian, agate, chalcidony, and similar stones. On examining the oldest Mesopotamian engravings on precious stones a skilled workman would see at once that nearly all the work had been done with only two instruments, one for the round hollows and the other for the straight lines. In the designs cut with these tools we find curiously complete likenesses of the small lay figures with ball and socket joints used by painters,¹ as in fig. 29, after Perrot and Chipiez.

According to Professor Petrie, "Cylinders are often met with in early times, but died out of use almost entirely by the eighteenth dynasty."²

Fig. 30 shows a water-washed quartz crystal, into either end of which the writer bored a hole, which is indicated by the dotted lines. One end was bored with a solid copper point, hammered into shape with a quartzite hammer, which point was then used with emery; in the other end the hole was bored with the point of an ordinary wooden toothpick and quartz sand. Each of the points was used in a pump drill. The end bored with the emery required not one-fifth of the time occupied in boring the opposite end, upon which quartz sand was used. The explanation was simple: the emery was much harder than the crystal and cut it, whereas the quartz sand, being of similar hardness, scratched but slightly. The characteristics of cutting with emery in quartz are identical with what we see in ancient bored implements of quartz crystal.

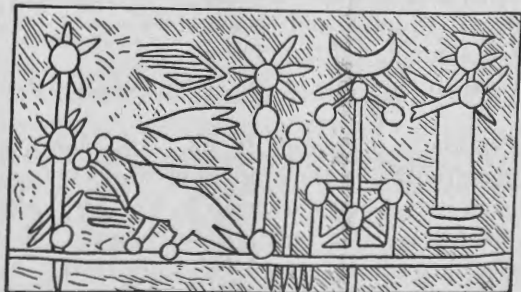


Fig. 29.
MESOPOTAMIAN CARVING.
From a figure by Perrot and Chipiez.

to be suspended. Later scarabs were made from a kind of faience ware and were molded into shape. The later scarabs of faience (fig. 31) were molded with all necessary holes, yet the early Egyptians probably mended their implements in the same manner which the American



Fig. 28.
ASSYRIAN AND BABY-
LONIAN HEMATITE
CYLINDER.

From a specimen in the U. S.
National Museum.

The scarabs of Egypt were made of stone, varying in length from three-fourths of an inch to three inches. They were carefully made and have diminutive holes bored through their longest diameter to allow them

¹ Perrot and Chipiez, "A History of Art in Chaldea and Assyria," New York, 1884, II, p. 261, fig. 139.

² W. Flinders Petrie, "Ten Years' Digging in Egypt," p. 145.

Indian employed, who, when he broke his so-called ceremonial implement, bored a hole or holes through the flat sides of the instrument, only requiring a few minutes' work, and bound the broken pieces together by lacing with wet hide, which was allowed to dry, a method commonly employed with their pottery, of which an example is here presented in fig. 32, a process with which all American archæologists are probably familiar.

The value placed upon stone implements by those who made them is probably better evidenced by their perforations than in any other way. The holes bored through American implements in a majority of instances appear to have been made to enable their owners to suspend them by thongs, as it was seldom that such things were attached to handles.

The woman's knife of the Eskimo was bored for attachment to its handle, as were the so-called tablets; celts from all parts of the world and of all kinds of stones are at times found with holes bored through them; the *méré* or *patu patu* of the New Zealander is invariably bored to enable it to be attached to the wrist.



Fig. 31.

SCARAB FAIENCE WARE.

Egypt.

From a specimen in the U. S. National Museum.

Figs. 33 and 34 represent, respectively, an elevation of a syenite ax and its longitudinal section (from an illustration in the Proceedings of the Society of Antiquaries of Scotland) which was found at Engadeh, in Upper Egypt. It is $4\frac{1}{2}$ inches long by from 1 to $1\frac{1}{4}$ inches in thickness, and belongs to the type of celts, yet the perforation is unusual in size,

varying from three-fourths of an inch at the surface down to one quarter of an inch where the two perforations meet in the center of the stone. This hole has therefore certainly been bored by means of a solid shaft. A depression has first been pecked into the surface to steady the point of the drill, as is generally the case in bored stones of Egyptian origin which have come under the writer's observation.¹

The museums of the world contain in their collections no finer specimens of the handiwork of primitive people than are the so-called ceremonial implements, at times called banner stones, found along the entire Atlantic seaboard of the United States from Maine to Florida, and from the Atlantic to the Mississippi. These implements are bored with an accuracy equal to that of the Egyptian cylinder, the holes usually being about three-eighths of an inch in diameter, bored through stones such as indurated clay or banded slate. These are easily bored,



Fig. 30.

BORED PEBBLE OF CRYSTALLIZED QUARTZ.

Cat. No. 169331, U. S. N. M.

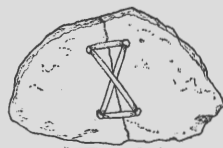


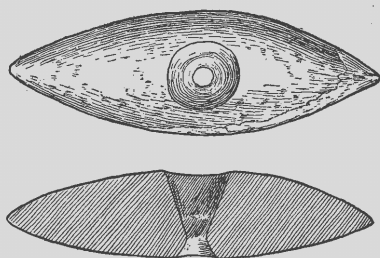
Fig. 32.

MENDED POTTERY.

Cat. No. 22316, U. S. N. M.

¹ Cf. Proceedings of the Society of Antiquaries of Scotland, 1891-92, p. 398, fig. 1.

though specimens are found made from stones of harder texture, such as serpentine or granite. The perforations are commonly made by solid drill points, yet perforations with tubular points are by no means rare, especially where hard stone was used. Pieces of these implements are often found which are broken through the original shaft hole, its



Figs. 33 and 34.

SYENITE AX, BORED.

Engadeh, Egypt.

From an illustration in the Proceedings of the Society of Antiquaries of Scotland, II, 1891-1892, p. 398.

thinnest and consequently its weakest part. The broken halves with one or two holes bored through the thin diameter of their blades, just outside the original hole in the implement, are often found in Maryland. Archæologists at times refer to these additional perforations as evidencing the great value attached to even the halves of such implements for the purpose of suspending them about the person.

Were this so, it would be a striking instance of the expression of sentiment which can hardly be claimed as a prominent feature in any primitive people of whom we have knowledge. These side holes are demonstrably bored for the purpose of preserving in its entirety the ceremonial implement rather than for saving a part. By the lateral holes, as seen in fig. 35, one can readily lace pieces of hide, which when dry will hold the broken parts together with a strength little less than that possessed before they were broken apart. The name of these graceful objects is unfortunate; for that they were in any way used for any ceremony or were carried in procession as banners are assertions but little more entitled to consideration than would be the statement that they were used as evidences of debt. The name conveys to one unfamiliar with stone implements no reasonable idea of the shape of the instrument. These implements are carefully finished, invariably bored, and with rare exceptions are most symmetrically shaped, and usually of a soft mineral. There are few of them that with rude tools could not be shaped and completely made by a reasonably industrious man between sunrise and sunset of an average summer day, or, to be more exact, within twelve hours of working time.

Fig. 36 shows a steatite ceremonial implement which was pecked with a stone hammer into shape by the writer, bored by means of a pump drill with wooden shaft and sand, ground smooth with a piece of sandstone, next with a jasper pebble, and finally rubbed with a piece of wood and a piece of buckskin as a polisher. This implement is shaped

Fig. 35 shows a broken ceremonial implement with a hole bored through the side for repair.

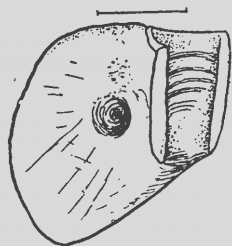


Fig. 35.

BROKEN CEREMONIAL, SHOWING HOLE FOR REPAIR.

Berks County, Pa.

Cat. No. 6665, U. S. N. M.

entirely by the eye, the hole meets with accuracy in the middle, and the surface is as smooth if not smoother than the average implement of Indian manufacture. Less than five hours was required to make this object. To have made it of indurated clay would possibly have required a day's work. The writer would say of the many ceremonial implements in public and private collections in this country that the majority of them would, to make a liberal allowance, require less than three days in their manufacture. There are, of course, exceptions to the rule, but they are believed to be rare. Such an implement made of granite would require much more time to fabricate, but such should not be taken into consideration beside the thousands made of softer minerals. At times the holes are perfectly smooth on the inside; at other times the striæ of the sand or drill point have persuaded authors to believe that some blade or tool of great hardness was required to produce them. That material for such implements was selected with care no one who has ever seen them can doubt. In symmetry they are not excelled by implements from any other country. The perforations through ceremonial implements are not often over one-half inch in diameter, and it is observed that, like the ax-hammer, they are at times bored with the solid drill point, and at other times they are bored by means of a tube. Occasionally the holes through banner stones are seen to be somewhat elliptical in shape, as is noticed frequently in the ax hammer.

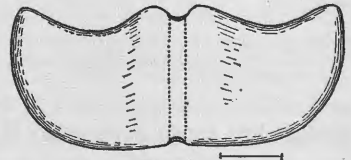


Fig. 36.

CEREMONIAL IMPLEMENT OF STEATITE.

Cat. No. 165105, U. S. N. M.

The size of the holes bored in American implements is quite small, those through red jasper found in Mississippi being little over one-thirty-second of an inch in diameter, and bored by means of solid drills which are the smallest observed in the collection of the U. S. National Museum. When the primitive American desired a hole through skin, wood, bone, shell, or stone of any hardness, from steatite to jasper, he does not appear to have found any difficulty in making it. If the savage of America, living in a pure age of stone, found means to perforate hard minerals, so could the native of other countries if possessed of similar means. As a natural consequence, argument claiming that the ax-hammer, from its shape, is an implement belonging to the age of metal is based upon insufficient grounds, and may at least be said to be questionable. The claim that the Egyptians knew the working of the diamond drill is not tenable, if the perforations can be accounted for and readily accomplished by simpler methods.

Theories of the wonderful methods employed by early races to accomplish a given purpose have always been popular, the marvelous, for some unknown reason, being the most taking side of any controversy

relating to antiquity. The art of hardening bronze, whereby diorite and syenite could readily be cut, may be said to be a general belief, so persistent has been its assertion as one of the means employed by

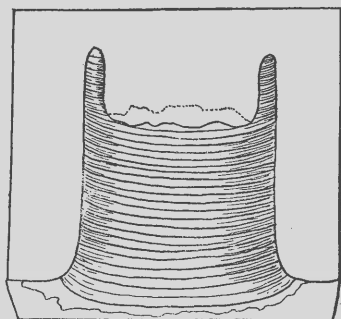


Fig. 37.

TUBULAR DRILL HOLE IN GRANITE.

Egypt.

From a figure by Petrie, taken from an illustration in the *Journal of the Anthropological Institute of Great Britain and Ireland*, XIII, 1884.

natives of South America and of Egypt, and it has even been claimed that such tools have been found, the art of hardening bronze rediscovered, and other equally baseless suggestions. Others, to be yet more remarkable, have suggested that the art of softening stones is one of the lost arts. The writer has been able to demonstrate with reasonable certainty that all work of which we have any knowledge ever done in hard stone, may be performed equally well with a stone hammer, or may be ground out by the aid of sharp sand, whether it be the sculptures of South America, of Asia, of Europe, or of Africa. Not only has the work been done as suggested, but there is proof of it in Theban paintings and stone carvings showing the Egyptian workman employed with the stone hammer and the grinding stone performing the work itself. It is susceptible of proof that without exception the smallest or the largest perforation in any Egyptian monument or relic could be drilled with tools which the Egyptians can be shown to have had a knowledge of, as it is proposed to demonstrate, and to show further that they were not jeweled nor were they even necessarily made of metal.

Prof. Flinders Petrie illustrates a tubular drill hole in granite showing the core still in the hole (fig. 37). He shows also by itself a core having deep-cut spiral lines (fig. 38). These two, he claims, were cut by means of a graving tool of some jewel harder than quartz, and he denies that the hardest tempered steel could do the work. He asserts that these cutting points must have been bedded in bronze to cut with such regularity. He denies that loose diamond powder or soft iron and sand, as used by the Chinese or the workmen of other nations who cut by means of soft metal and a harder powder, will any of them plow the material as illustrated. He has experimented with beryl and sapphire, and the deepest scratches he can make are not one-tenth the depth of the ancient cuts on the same piece. His

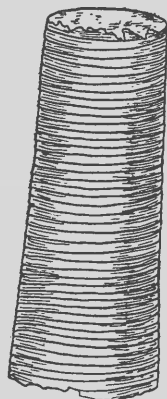


Fig. 38.

CORE FROM HOLE DRILLED IN SYENITE.

From a figure by Petrie, taken from an illustration in the *Journal of the Anthropological Institute of Great Britain and Ireland*, XIII, 1884.

conclusions are expressed in favor of the diamond, and he thinks the pressure must have been two or three tons to cut a 4-inch hole in granite.¹

These views do not appear to have been concurred in by Sir John Evans and others present at the reading of the above paper, but do appear to be accepted by a large number of archæologists and Egyptologists. It is to be regretted that the experiments were not carried further and a drill, with the head pressure suggested by Professor Petrie, employed. Had this been done, it is believed that the force necessary to move a drill of the weight suggested would have presented insuperable obstacles. The dimensions of the holes bored show the perfection to which the Egyptians had carried their drill, and to the writer's mind is conclusive evidence that at the period at which such holes were bored, those who did the

work did not use steel or similar hard metal, and further, that the drill was the speediest way which they possessed of perforating the stone; for it appears unreasonable to suppose that the Egyptians differed so from all others who preceded or who have succeeded them as to waste time unnecessarily and habitually in accomplishing a thing that it was customary to perform in their everyday mode of life. The smallest core of which Professor Petrie speaks (fig. 39) is only two one-hundredths of an inch in diameter, and is



Fig. 39.

SMALL STONE CORE.
Egypt.

From an illustration in the Journal of the Anthropological Institute of Great Britain and Ireland, XIII, 1884.

made, he says, by a drill twenty-five one-hundredths of an inch in diameter.



Fig. 40.

SOCKET FOR EYEPIECE
OF STATUE.

Cyprus.

Cesnola collection, Metropolitan Museum of Art, New York City.

Fig. 40 represents an artificial eyepiece in one of the statues of the Cesnola collection of Cypriotic antiquities. The ring in the piece has been drilled, and subsequently the exterior of the stone in which it is, has been cut down and neatly let into the eye of a statue in which it was made to fit. The imitation of the eye here referred to was evidently intended to be accompanied by a setting of some artificial substance to give a more lifelike appearance to the eye.

Fig. 41 illustrates a drill core made in experimenting with the disk drill of the Egyptians, which will later on be more particularly referred to.

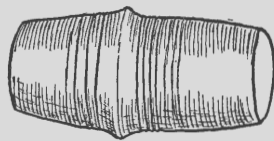


Fig. 41.

DRILL CORE FROM RECONSTRUCTED
DISK DRILL.

Cat. No. 136349, U. S. N. M.

Fig. 42 shows two holes bored through a block of catlinitite with the

¹Petrie, "The Mechanical Methods of the Ancient Egyptians," Anthropological Institute of Great Britain and Ireland, XVII, p. 89. See, also, "Ten Years' Digging in Egypt," by the same author.

same drill, the end of the drill shaft having in one instance a thin mercantile copper cylinder for a point, and in the other case a point made by utilizing a galvanized iron coupling from a 1½-inch water pipe, about three-eighths of an inch thick through the sides. Each of these tubes was used with sharp quartz sand; beginning with the use of the water pipe, after perforating a hole one-third of an inch deep, because of the thickness of the pipe, which caused the removal of such an unnecessary amount of material, the perforation was completed with the thin copper cylinder. The striæ on the core, as also on the interior of the cylinder, were very distinct, being caused, as they were, by grains of sand working in one place as the drill alternated back and forth.

A careful examination of a moss agate cylinder of Assyrian origin five-eighths of an inch in length with a diameter of one-half inch with a perforation about one-sixteenth of an inch in breadth bored through its length (the specimen being of very archaic workmanship), presents clear evidence that a solid drill and a wheel were both used in its manufacture. The drill marks in the cutting are quite diminutive, though under an ordinary magnifying glass they show the circular striæ, and the straight lines show the longitudinal striæ as a small wheel would wear them. Notwithstanding the doubt which has been expressed on the subject, the evidence appears strong that the Assyrians knew and used the principle of the wheel since a period prior to B. C. 3000.

No people of ancient times have made more wonderful perforations in stone than have those of Mexico, as is abundantly illustrated by their obsidian masks, vases, labrets, rings, and the numerous bored objects of quartz crystal and of nephrite. Wide obsidian rings of hour-glass shape were exhibited in the Madrid Exposition. These were worked down to a thickness of one-sixteenth of an inch.¹

An examination of a number of jade figures and objects from Oaxaca, Mexico, in the private collection of Mr. A. E. Douglass, of New York City, shows that holes one-sixteenth of an inch, or less, in diameter were bored in the hardest stones, the bottoms of which have conical projections, indicating clearly the use of a tubular drill. From the very sharp edges and small perforations it would seem that these holes had been bored with metal tubes. At other times, how-

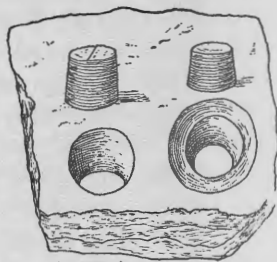


Fig. 42.

HOLES BORED IN CATLINITE WITH DISK DRILL.



Fig. 43.

HEAD OF NEPHRITE.

An illustration of tubular drill work. Tasco el Viego, Mexico.

Cat. No. 96994, U. S. N. M.

¹ Walter Hough, "Columbian Historical Exposition in Madrid," *American Anthropologist*, July, 1893.

ever, the small holes have been bored with solid points, probably of copper carrying grit.

A fine specimen of aboriginal work on a nephrite pebble, from Tasco el Viego, Mexico, is illustrated in fig. 43. This specimen clearly shows the employment of a metal drill of tubular form, and also one having a solid point. The ears have been designated by means of a depression made with a tubular drill having a shallow core not one-fourth of an inch in diameter, yet in this small space a still smaller tubular drill has made a depression, leaving a cone in its center little more than half the diameter of an ordinary pin head. The eyes are similarly bored, and on the back of the head on either side below the ears small holes, an eighth of an inch in diameter, have been bored at an angle to each other, as shown by the dotted lines, until they meet at the point of intersection, thus allowing strings or wires to be passed through the holes for purposes of suspension. The other marks on this interesting specimen have been made by grinding with a narrow-bladed tool, possibly of metal. It may be doubted if holes more neatly cut than those in this object could be found on any article of eastern origin in stone of like hardness. The Mexican natives, as, in fact, the natives of other countries where nephrite or jade is found, sawed this

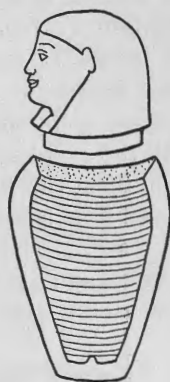


Fig. 44.

CANOPUS IN THE MUSEUM OF THE UNIVERSITY OF PENNSYLVANIA.

Egypt.

stone with great facility. Quartz sand or quartz blades will cut nephrite rapidly. The means by which it is employed will suggest themselves, depending on the manner in which it is intended to cut the stone, whether it be by sawing, grinding, drilling, or polishing.

The magnificent collection of jades and other hard stones, chiefly of Chinese and Indian origin, belonging to Mr. Heber R. Bishop, of New York City, contains an agate vase six inches in diameter, and a number of jade vases of even larger dimensions, which have apparently been bored with both tubular and solid drill points.

None of the remains of ancient Egypt are of greater interest than are the stone Canopi (jars) intended for the reception of the viscera of the dead.

These jars are carefully bored and have closely fitting covers, upon which are artistically carved one or other of the four genii under whose protection the viscera were placed.¹



Fig. 45.

CANOPUS IN THE MUSEUM OF THE UNIVERSITY OF PENNSYLVANIA.

Egypt.

¹ Adolf Erman, "Life in Ancient Egypt," London and New York, 1894, p. 306.

Figs. 44 and 45 represent specimens in the Museum of the University of Pennsylvania, eleven inches high by six inches in diameter, outside measurement. The interior of the receptacles has a depth of nearly eleven inches, by a diameter of three inches. The cone at the bottom, as seen in fig. 44, is evidence of its having been bored by means of a tubular drill. Here, too, there are indications in the rim of the top of the vase that the perforation was commenced by first picking a depression for the purpose of steadying the drill shaft. These jars are quite commonly made from stalagmite, which is easy to bore with the simplest abrading substance. The tops of these vases have upon them the head of a monkey, a dog, a hawk, or a human being, carved from a solid block and shouldered to fit the vase. Of these jars there are specimens both in the Museum of the University of Pennsylvania and also in the Metropolitan Museum of Art. These Canopi date back to the fifth dynasty, and they are at times made of syenite, translucent hornblende, transparent quartz, and alabaster.

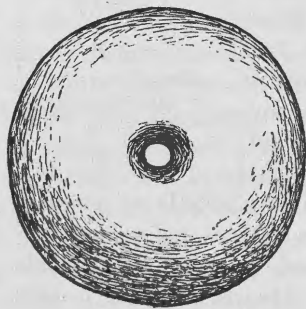


Fig. 46.

STONE DISK.

Nashville, Tenn..

Cat. No. 32062, U. S. N. M.

There are in the collection of the U. S. National Museum a number of stone disks which it is difficult to classify, as they vary so greatly in size. Certain of them are possibly intended as spindle whorls for spinning, others again are much too heavy to be used for such purpose, and may have been employed as disks for the shaft of the pump drill, and are consequently comparatively modern.

Fig. 46 illustrates an indurated clay disk from Nashville, Tenn., collected by Maj. J. W. Powell, the hole through which has been made by means of a solid point, and would be equally suitable for use on a drill or on a spinning staff. Disks have been found in many ruins of the world dating from the remotest period; they are usually made of burned clay, yet specimens have been found of different kinds of stone, from the softest to the hardest.

The disks of pump drills in the U. S. National Museum are usually about three inches in diameter, with a thickness of one-fourth of an inch, yet many are of less diameter and greater thickness. They are ordinarily made of wood, yet there are specimens made of pottery and also of stone, although on the drills where this is the case it is strongly suspected that it is the disk of a spinning shaft which is thus utilized. Pump drills are commonly found among the Pueblo Indians, though they are employed to a limited extent by other tribes.

According to some authorities, in place of a disk the New Zealanders worked on their drill two stones, although the authorities who should

be best informed on the subject disagree so radically that it is impossible to reconcile their several opinions.

Disks made from sherds of broken pots were apparently in common use among the early races of Europe and of Asia, and in the United States it is quite a common thing to find pieces of broken pots with holes bored through them; but such holes in America do not appear to have been for the purpose of utilizing them as disks, but rather that a cracked pot might be repaired. While these holes are usually bored one-half from either side, occasionally they are found having been bored entirely from one side. There is no necessity to bore pottery from both sides, yet it is essential that in boring stone where a deep perforation is to be made, one part should be bored from either side. In the first instance, an irregularity in the shaft hole may be corrected if it occurs in the center of the hole, whereas it would decidedly mar the symmetry of the implement were the hole only bored from one side and it came through out of line. In the second place, the deeper the hole, the greater is the friction and incidental drag of the shaft.

DRILLS.

This subject may be said to include all implements with which primitive races have made holes in substances by any artificial means whatever, including the construction of the tools and the means of working them.

A great deal has been written on the subject, but it has appeared in many languages, scattered through scientific magazines and publications on archæology, and much is to be learned on the subject from books of travel. There exists a great variety of opinion as to the means employed in early ages in making holes. It has been suggested that holes could be bored with a point of stone or with a wooden shaft with sand and water, but, so far as the writer is aware, archæologists have usually been satisfied, after successfully boring a hole with any one implement, that the subject had been exhausted. Authors alluding to boring are referred to so far as they have come under the writer's observation, and it is hoped that the more important ones have not been overlooked.

Sir John Evans suggests that the use of the drill of some form or other to which rotary motion in alternate directions was communicated by means of a cord, is of great antiquity.

Dr. Keller has shown the employment of some kind of tube as a boring tool. Gutmuth suggested a copper or bronze tube used with pounded quartz or sand and water. In the Klemm collection, in Germany, there is said to be a bronze tube five inches long and three-fourths of an inch in diameter, found near Camnez, in Saxony, which the owner considered as one of the boring tools used in the manufacture of stone axes. Von Estorff goes so far as to say that the shaft holes are in some cases so regular and straight and the inner surface is so smooth

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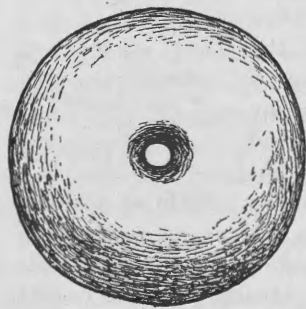


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that they could only have been bored by a metallic cylinder and emery. Lindenschmidt says it was done by a hard stone or plug of hard wood and sand and water, or that the work was performed as described above by Gutmuth, as some holes are shown as sunken rings instead of a mere depression. Mr. Lee cites a friend who suggests a hollow stick, such as an elder stem. Evans says his experience confirms this, but he found sand liable to clog and collect in the hollow part of the stick and thus grind away the top of the core. He suggests that "if fine sand were used, this would probably not be the case." Mr. Rose suggests a hollow bone. Professor Rau suggests hard and tough cane. Dr. Keller experimented with a portion of ox horn, which he found very effective. Mr. Troyon considered that the work was not done by a hollow cylinder, as it would not produce so conical an opening, and suggests that the ax was placed in a revolving lathe and was cut with a bronze tool and sand and water, and he mentions axes that must have been bored with a metal point and not with a hollow cylinder between the core and the body of the ax. De Mortillet thinks some of the Swiss axes were bored in the same way. M. Desor, though admitting that a metal tube would do it best, refers the stone axes to a period when metal was unknown, and he suggests that thin flakes of flint may have been fastened around a stick. Kirchner suggests that steel tools were used in boring axes, and even Nilsson is inclined to refer them to the iron age. He considers it impossible to bore such holes with a wooden pin and wet sand. Evans says: "In some stones, however, such holes can be bored with wood and wet sand, and in such cases, where the stone to be worked upon can be scratched by sand, the boring by means of wood is possible, given sufficient time and the patience of a savage."¹

A scrutiny of any collection of stone implements which have been bored will convince one of the different characteristics of boring and bored tools. Dissimilar means may have been employed, possibly by near neighbors, in the accomplishment of similar results. This difference is known to exist in chipping stone, as there are a dozen or more authentic accounts of eyewitnesses to the manufacture of arrowheads in as many different ways.

Fire is often produced by a revolving shaft, yet there are many ways of revolving the shaft, and each one has been employed by some tribe of which we have accounts. The awl is the most primitive perforator, yet the straight shaft, revolved between the outstretched palms of the hands, may be said to be the most primitive drill. The strap or bow drill is, in most respects, an improvement on the shaft worked by the hands, and the pump drill is an improvement on the bow drill. Yet these improvements are often more imaginary than real, and we find that the plain shaft has never entirely gone out of use with people who were thoroughly acquainted with the other drills.

¹Cf. "Ancient Stone Implements of Great Britain," and the cases there cited, p. 40, and elsewhere.

The improvement of one drill over another consists more in the increased revolutions which may be made in a given time than in the superior work done by a particular tool. The speed of a drill varies, naturally, according to the skill of the workman manipulating the tool, yet the character of work will at times cause the speed to vary still more. In boring small beads the pump drill would probably be preferable to any other tool, as the object may be easily held in the left hand, while the right hand controls the implement.

It would be difficult with this tool to bore a hole through one of the large ceremonial pipes because of the binding of the shaft as the hole deepens. The bow and strap drills are more suited to the character of work required in a northern climate, where the sleigh runners and other heavy bone and ivory objects require large perforations.

As a general rule, primitive people worked the shaft drill by holding the object it was intended to bore between the feet or the toes, according to the size of the article to be perforated. If the shaft is horizontally manipulated, one hand holds the object; if, however, the shaft is perpendicular, it must be held between the extended palms of the hands.

With the bow drill one hand usually steadies the shaft-head socket, while the other works the bow. With the strap drill the object is held commonly by the workman's knees or is pressed on the ground, and if manipulated by a single person, as it commonly is worked, one of the necessary accompaniments is the headpiece, which is held in the teeth, imparting a jarring motion to the head by no means pleasant. Owing to the manner of working it, greater power may be imparted to this drill than to any other used on this continent by primitive people. It is generally employed by the Eskimo in their heaviest work. The double-handed bow drill, with the head piece held in the teeth, is an improvement on the strap, in that its manipulation allows a greater relaxation of the muscles of the arms than does the strap drill.

The pump drill appears to have been introduced into the southwest by the Spanish, to whom it has been familiar for centuries. The strap drill, while known for a long time to the Eskimo, may have been imported to this continent in several ways from Japan, Siberia, or Europe.

The direction of mechanical distribution is apt at times to lead to error for want of sufficient data upon which to predicate an opinion, yet no subject can be more instructive than this from an ethnological point of view.

It would naturally be supposed that a people possessed of bows and arrows would have discovered the principle as well as the uses of the different drills, yet the writer finds no early traveler who refers to the aborigines of America using other than the plain shaft drill. Had other drills been employed by the natives, someone would almost inevitably have referred to them, as they repeatedly have done to the shaft drill, yet to the writer's knowledge no one has done so.

The bow drill in Asia and in northern Africa dates back to a period as early as the first monuments of these countries. The strap drill may be said to belong to a similar mechanical period, and on monuments of Egypt, from the fourth dynasty, is found a disk drill which appears to owe its origin to Egyptian culture. This drill appears to have gone into disuse centuries ago, though it will be shown that a drill somewhat on this order has been used in Europe as late as the year 1600, since which time, however, it appears not to have been used.

History does not relate of a period so remote that drilling was not well understood. Tradition is no better, and the most ancient evidences of man on earth are quite commonly accompanied by objects which had been perforated by him in an earlier geologic epoch than that in which we live.

There can be imagined hardly a kind of perforation which has not at one time or another been adopted by man. Pecking, cutting, scraping, and grinding have all been employed, and a careful examination of specimens will usually show that the method employed to make the hole was the best one of which the circumstances would admit.

The experiments made by the writer, while doubtless leaving much to be desired, demonstrate conclusively that many processes were adopted in boring holes by primitive peoples, that a variety of tools also were used, but that the actual cutting processes were probably very similar in all countries.

Every indication has a tendency to strengthen the belief that the methods employed were simple and that the work was easily performed. This is contrary to the prevailing opinion among archæologists, though recent investigations are fast forcing the conclusion that primitive mechanical methods did not entail the vast amount of patience which they would be supposed to require.

All travellers speak of savages as being idle people so far as work is concerned, although in war or on hunting parties they may exhibit great patience and industry, or they may undergo great fatigue, though even here we find them only human, for it is submitted that no man willingly expends ten minutes of labor where five would be sufficient to accomplish the desired purpose. Civilized man and the savage do not differ greatly in this respect.

An ordinarily smooth block of catlinite was employed upon which to bore different sorts of drill holes with different tools, and afforded a fund of interest as to the means employed in making different characters of holes, such as are noticed in implements belonging to the stone age and early metal periods. Catlinite being an indurated clay, it was found that drill points either of stone or metal readily took hold of the mineral and cut rapidly so long as the edges of the points were kept rough. Solid points of wood or of bone were not effective, as they made very slight headway and had a tendency to polish rather than to cut. With the use of dry sand, however, some wood was found almost as

effective in cutting as stone or metal, for it is the sand which abrades the material in such a case.

Where hollow cylinders are employed in drilling it is necessary to guide the end of the drill in order to keep the point in the same place. There are two different ways which were adopted to accomplish this purpose, of which it is difficult to say which is preferable. One was to peck into the surface of the stone a depression of sufficient size to hold the point of the drill deep enough to make the tool bite; the other was to cut a hole slightly larger than the drill point into a piece of wood and to hold it in position a sufficient length of time to allow the point to cut in far enough to keep it from jumping out as the drill revolved. The depression necessary to accomplish this purpose was much less than one would suppose, and needed to be less with one familiar with the manipulation of the drill than with one not skilled in its working.

There are peculiarities in different stones and even in individual specimens of what would be called the same stone. These peculiarities can be learned only by those working them, and sometimes then only after long trial does one discover the treatment proper for each stone. A brass cylinder bored catlinite with comparative ease so long as its

edges were kept rough, yet hammered copper cut it much better owing to the particles of quartz crystal taken up by the copper, the reason of which was that the copper was hammered into shape from a nugget with a quartzite hammer, where-



F g. 47.

TYPICAL DRILL POINT.

From a specimen in the U. S. National Museum

as the brass had no grit in it and consequently wore smooth when the copper did not. Water was found to be impracticable for use in boring catlinite, as the material ground into powder made a cement on becoming wet, and formed a hard crust in the perforation, until the shaft choked and would no longer revolve, unless it was cleaned out by cutting the crust so formed loose from the sides of the perforation. Even dampness in the shaft interfered materially in this respect. It was soon discovered that the typical drill point (fig. 47) was probably not an implement used in drilling hard stone, because of its tendency to snap in two if not held perfectly straight, but this implement would be most serviceable in boring wood, and in the writer's opinion serves the purpose rather of a gimlet than of a drill. That objects are almost invariably bored from both sides has its explanation in the fact of the greater facility with which the work can be done if the perforation be half from either side. In boring with drill points of stone or metal without sand, choking usually begins to cause trouble at about five-eighths of an inch from the surface. In using the metal drill on most stones, water obviates the choking, and sand and water make the work progress even more easily. If a cylinder be used, however, with sand, unless extreme care be taken in supplying the sand, it will increase the friction unnecessarily and the

drill will be cutting inside and outside the tube instead of only at its base, as would be the case were the sand properly fed to the point of the tube.

A slight depression first being made, a drill point of stone or bone or even wood, used with dry sand, is quite effective, for after all it is the sand alone which does the cutting. In the beginning of the drilling the solid drill expels the sand, yet as the hole deepens it does so less and less.

There are many little knacks of manipulation that one picks up in working the drill. With the pump drill a jumping motion may be given to the point that keeps it always supplied with sharp sand, which is difficult of explanation, yet very effective in expediting work, and easily understood if one works the tool for only a few hours.

In boring most of the harder stones where stone or metal points were used with sand, water expedited the work by floating the powdered material off, thereby allowing the grains of sand to be brought in contact with the surface which was to be cut. If, however, a wooden shaft point is being employed, water retards the work very materially by softening the wood and allowing the sand to cut the drill point away.

No hard and fast rules can be established in regard to boring unless the particular stone to be bored, as well as the point which is to do the boring, be known, and even then allowances have constantly to be made for structural differences both of shaft and object. In selecting drill shafts of wood, care must be taken not to select a wood too hard, and to choose wood which is too soft is equally unfortunate. In the first instance, if the

stone to be bored is hard, a hard wood rolls the sand and rounds its edges; in the second place, if the shaft is soft, the same stone has a tendency to wear away the shaft. In the writer's experience he has found hickory to be as much too hard as pine is too soft for drill points. Ash apparently furnishes one of the best shafts, as it has a tendency to hold the grains of sand firmly while they cut, as in a matrix.

Although there are exceptions to the rule, it is noticeable that the bored implements in the U. S. National Museum are commonly of indurated clay or some stone of similar hardness, such, for example, as is furnished by banded slate. In Mexico, however, nephrite, obsidian, and crystals are found that have been bored with holes, usually of small diameter. It may reasonably be presumed that the natives were cognizant of the best cutting material which their country afforded, for, even if not sought for and found, accident would sooner or later lead persons to discover its existence and to use it.

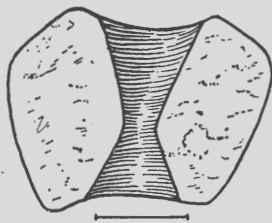


Fig. 48.

SECTION OF CEREMONIAL OBJECT
MADE OF SILICEOUS STONE.

Cat. No. 166107, U. S. N. M.

Fig. 48 is a drawing of one of the earliest products of the writer's

experiments in boring, and was drilled by means of the pump drill. It is of siliceous material, and is quite hard. The point used in drilling this object was of jasper, although the stone was somewhat pecked to give it a more graceful form than it naturally possessed. It required only about three hours' labor to both shape and bore it.

The specimen shown in fig. 49 was drilled by means of a bow drill through siliceous sandstone with a jasper point and sand and water. It was found that without sand and water the point quickly wore smooth and ceased to cut. With sand only, the sand powdered and choked the drill. By covering the sand with water, however, the powdered material floated on top, allowing fresh sand to sink to the bottom and cut.

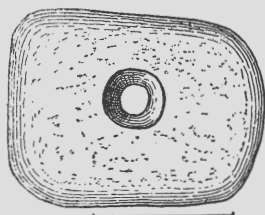


Fig. 49.

PERFORATION IN SILICEOUS SANDSTONE.

Cat. No. 166106, U. S. N. M.

Fig. 50 shows a piece of serpentine into the top of which a hole was drilled by means of a stone point and dry sand. The dotted lines show the depth of the perforation, and from it may be seen how readily a pipe bowl could be made by boring a hole for a stem at the base of the drill hole. The eye was the only guide which primitive man had to rely on in making his implements of stone, which he always made of symmetrical shape; for crooked and distorted outlines seem to have always been avoided by human beings from the earliest period; and if we may judge from the implements preserved in the various collections of the world, man has, from the remotest time, been invariably influenced by the attraction of graceful curves, as he has been by the charm of color.

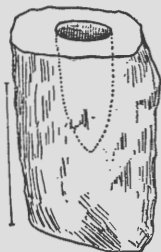


Fig. 50.

SPECIMEN OF DRILLED SERPENTINE.

Cat. No. 166093, U. S. N. M.

Velocity has, as a matter of course, a great deal to do with the rapidity with which a drill cuts, and the pressure on the tool also makes a material difference. The hardness of the cutting point is equally as important as either of the other essentials, and the shape of the point is also a consideration in the efficiency of the drill. Yet the rule can not be set down as invariably correct, for if the cutting point revolves too often in one direction without reversing its action, the motion has a tendency to pack the powdered material under the drill point and thus to deter its cutting. The pressure on the drill if too heavy will crush the sand or even the point of the drill, or cause it to chip unnecessarily, thus detracting from its efficiency.

There are many differences in tools, material, and the rapidity with which work may be performed in drilling that are constantly becoming apparent, yet the important matter is always there, i. e., that there are few stone tools which it would have required more than two or

three days at most to complete from the unformed material of which they happen to be made.

The necessity of having holes through objects, whereby they might be suspended, or by enabling one article to be bound to another, must have been contemporaneous with a first recognized ownership of property. The pin or needle, the awl, with and without a handle; the punch, the scoop, the rimmer, gimlet, auger, and drill, and, we may say, the hammer, have all played their parts in enabling primitive man to make holes. The depth and size of the hole, the texture of the material to be perforated, each had its influence on the means necessary to perforate them.

We may reasonably believe that man first learned to bore holes before he did to make fire, yet it is well known that fire making and boring or sawing are similar in their mechanical requirements, the presumption naturally being that drilling led to the discovery of fire making.

The art of fire making has been exhaustively treated by Dr. Walter Hough in his admirable paper entitled "Fire-making Apparatus in the U. S. National Museum,"¹ and Mr. J. Romilly Allen has also described fire-making implements in a very able manner in the Proceedings of the Society of Antiquaries of Scotland.² Persons familiar with the two papers will see the similarity between the fire-making machine and the drill. In making fire friction was the essential feature, and to produce fire different methods have been often employed at the same time by the same people.

Whether the knowledge of different drills has been handed from tribe to tribe, and they have been thus distributed throughout the earth, or whether the knowledge of the principle of these implements has not been rather due to independent discovery, will probably long be a disputed question. The straight shaft as a drill appears common to the whole human race, with rare exceptions. The other drills are, however, so distributed as to leave much to further research as to the source from which they originally came. The natives of the American continents possessed apparently only the straight shaft drill at the time of the arrival of the Spanish. It has been declared by Tylor that some tribes of West Australia have no means of making fire.³ This, if correct, is one of the great exceptions to the rule.

Thomas Morton speaks of the Virginia Indians striking fire with instruments carried in a bag,⁴ which may mean either by concussion or the revolving stick, which has to be kept dry to act properly, though the production of fire by concussion appears by no means improbable, as it is referred to by so many travelers in different parts of the world.

¹ Rep. Smithsonian Inst. (U. S. Nat. Mus.) 1888, pp. 531-587.

² January 23, 1888, pp. 88-109.

³ Edward B. Tylor, "Researches into the Early History of Mankind," New York, 1878, p. 236.

⁴ Thomas Morton, "New English Canaan," p 23.

Mackenzie describes the Indians of the Northwest striking fire with pyrites,¹ and Thomas Ewbank refers to Hearn making the same reference in 1772 of a Dog Rib Indian. He also quotes Botturini as saying the Mexicans did the same, as did the Patagonians. Samiento, he says, met Indians in 1580 in the Straits of Magellan who struck fire with flint, and he refers further to the Arctic Indians making fire both by rubbing sticks and striking two stones together.²

The Aleuts, according to Dr. Dall, made fire with two pieces of flint.³ Captain Cook refers to the people of Unalaska in 1784 as making fire both with sticks and by striking stones together,⁴ and he also refers to the revolving stick being used by the Kamschadales, the Greenlanders, the Otaheitans, the New Hollanders, and the Brazilians.⁵

The ancient British, according to Sir John Evans, made fire by means of pyrites and flint, these implements being found in a barrow.⁶

This wide distribution of fire making by means of concussion appears to indicate a distribution of fire making by the two methods over a large part of the earth at an early period. Were these inherited arts, or were they matters of independent discovery, would be difficult questions to answer, though the theory of independent discovery would appear to be equally as likely as would distribution by contact with other tribes using the sticks.

Lewis H. Morgan makes the assertion that the Iroquoian *da ya ya dä gä neä tä* is an Indian invention of great antiquity, and refers to it as the only method known to them of making fire.⁷ The author describes this implement, which is nothing but a primitive form of pump drill, and an extremely rude one at that, so that his assertion is improbable as to accuracy, for we are told by authors of such reliability that there is hardly room for doubt that the shaft revolved between the hands was a well-known fire drill on the American continent everywhere. Besides this, the pump drill is certainly an extremely complicated implement, and it appears incredible that persons acquainted with its working should not know how to manage the simpler drills.

The native of New Caledonia shaped his fire stick with his teeth, as we are informed by Garnier.⁸ The Papagos of New Mexico made fire by plowing, as the writer is informed by an army officer who lived in their country for years and knew them thoroughly, and this process of making fire by the South Australians is described by Foelsche.⁹ The

¹ "Voyages from Montreal through the Continent of North America."

² Thomas Ewbank, "The World a Workshop," p. 55.

³ W. H. Dall, Geographical and Geological Survey, I, p. 82.

⁴ Cook, "A Voyage to the Pacific Ocean, 1776-1780," London, 1784, III, p. 3.

⁵ *Ibid.*, III, p. 111

⁶ "Ancient British Stone Implements," p. 284.

⁷ Lewis H. Morgan, "League of the Iroquois," Rochester, 1851, p. 381.

⁸ Jules Garnier, "Océanie," Paris, 1895, p. 80.

⁹ Paul Foelsche, Journal of the Anthropological Institute of Great Britain and Ireland, November, 1894, p. 190.

Bushmen made fire in this way, as may be seen from fig. 51, from Tylor,¹ and Smith describes the natives of Victoria holding the under stick by means of their toes.²

One of the best authorities on the distribution of the straight shaft fire stick, Rigg, refers to its use "in Australia, Tasmania, Sumatra, and the Carolines. It is found in northern India and among some of the oldest tribes of southern India. In the retired districts it is still employed by the wild Veddahs of Ceylon, south and west Africa, the Canary Islands, the Eskimo, and tribes of North America."³

Thomas Ewbank refers to Homer's Hymn to Mercury as—

kindling a fire to roast cattle he had stolen; is literally that of a Camanche or Apache after a buffalo hunt, or a foray into New Mexico:

And gathering fuel the inventor rare
To fashion fire did his wits renew.
Hermes first taught how sparks could catch;
'Twas he invented tinder and match,
For where the hard branches grew
He snatched a brand and stripped the bark,
Rubbed piece against piece till spark by spark
Was kindled and the flame upflew.⁴

This fire stick has an antiquity that one can hardly fathom, for not only is its history lost in America, North and South, but its presence antedates recorded time in Egypt, and Dr. Cyrus Adler, of the Smithsonian Institution, a well-known authority on oriental archæology and languages, informs the writer that the name of the Babylonian fire god, Ge Bil, had its etymology in the words ge (reed or stick) and bil (fire), consequently "fire stick."⁵ Fig. 52 is drawn after an illustration of this venerable god in bronze, which appeared in Harper's Magazine in January, 1894, in which is seen Ge Bil on his knees in the very act of producing the spark. This venerable relic Mr. W. St. Chad Boscawen refers to an age as remote at least as 4000 B. C. He says:



Fig. 51.

BUSHMAN USING SHAFT DRILL.

From a figure by Tylor.

M. Sarzec's explorations have made known to us the city of Sippar, or city of the great flame, the oldest quarter of which was Girsu Ki, in which Gudea 4000 years B. C. reigned over Chaldea. Almost every object on which Gudea subscribes his name contains a dedication to Nin Girsu. The name of Nin Girsu means simply

¹ E. B. Tylor, "Anthropology, an Introduction to the Study of Man and Civilization," New York, 1881, p. 262.

² R. B. Smith, "Aborigines of Victoria," II, p. 250.

³ Arthur Rigg, Cantor Lectures, Journal of the Society of Arts, August 6, 1895.

⁴ Translation in Blackwood, quoted by Thomas Ewbank, "The World a Workshop," New York, 1855, p. 50.

⁵ Cf. "Aboriginal Fire Making," American Anthropologist, 1890, p. 360.

"the piercer" of the mass. In many of the inscriptions of Telloh the god Nin Girsu is associated with the lord of the wood of life, or Nin Girsu, the fire god, the Prometheus of Chaldea, and therefore Sappara becomes the Pyropolis or fire city of Chaldea.¹

References without end might be offered to show the authorities who refer to the very general distribution of the fire stick which is essentially a drill, which in its very action of producing the spark "consumes the parent."

The origin of drilling would most naturally be supposed to have its genesis in the splinter of stone or a thorn or other substance held between the thumb and index finger, which, being firmly grasped and pressed upon a softer material and alternately turned to the right and left, the pressure continuing, would in time perforate it. A tool so held, only making half turns, would bore a hole, without great care were employed to avoid it, of a form more elliptical than circular. Such perforators would naturally be made of the most suitable material which nature there supplied. The sharp edges of a splinter of stone, of coral, or of shell tightly grasped between the fingers would soon bruise that part of the hand brought in contact with it, which of itself would suggest the necessity of obviating, if possible, the soreness caused thereby. To wrap the stone, or whatever the piercer was made of, with grass, or to hold it by means of a piece of soft skin of an animal, would be but natural; for the toughest cuticle would not long withstand the work without some protection. This wrapping, if done, would produce the awl, which is to-day but the primitive tool. The relationship of almost every other tool which we possess is traced through very few more changes than is the awl.

Metal is substituted for stone, a handle is attached, steam or electricity increases the rapidity with which the tool may be worked, yet the instrument remains practically what it was at its birth. The native Indian bored his pearl bead with a heated copper spindle, as related by early American travelers, just as the natives of the interior of Africa at the present day perforate almost every object with hot iron.

Roger Williams tells us that "before they ever had awl blades from Europe they made shift to bore their shell money with stones.² Wampum beads, we are told, "formed the currency as well as the ornaments of the Indians," a still existing custom, as we may see by coin pins and sleeve buttons, earrings and necklaces, the use of which prevails to a great extent even among civilized people. These beads were carved



Fig. 52.
GE BIL.

Bronze Babylonian fire
god.

From a figure by Boscawen

¹W. St. Chad Boscawen, "Egypt and Chaldea in the Light of Recent Discoveries," Harper's Monthly, January, 1889, p. 190, etc.

²Roger Williams, "A Key into the Language of the Indians of New England," Coll. R. I. Hist. Soc.

with no other or better implements than were furnished by sharp splinters of stone, yet, although the work was comparatively slow when compared with steel tools, its finish was at times most excellent.

It must be presumed that common sense came into play in the working of any tool by any race, and although we find at times radical differences in tools used and material worked, a difference in tools may usually be traced to local causes, and wherever there is data sufficient to guide us with any certainty it is sure to be discovered that the most primitive races have, with few exceptions, accomplished their work in the most expeditious manner which their surroundings admitted of.

Jones and Thruston refer to the Spanish and Portuguese references of the Indian habit of perforating pearls by means of "heated copper spindles."¹ The heated metal point could hardly fail to be employed by persons acquainted with the mineral, for it is an infinitely more expeditious method of perforating wood than any other known to primitive people. We see this in the wooden Alaskan pipe and in the long Siouan stem of wood, where the stem has not been split and subsequently rejoined.

In the ancient period, as even yet in many instances, the stems of wooden pipes are found to have been made by first splitting the stem and grooving it out with any cutting material, and subsequently rejoining the parts and either lashing them together or gluing them. Stone, shell, metal, or coral will, any of them, perform such work with equal facility. The Sioux usually employ the awl and burn or split and scrape thin pipe-stems; yet they are often marvels of ingenuity, and finished by painting the wood or covering it with the varied plumage of the most brilliantly colored feathers.

Certain Indians of Colorado, the writer is informed by his friend Prof. A. H. Thompson, made their beads by first perforating the stone and stringing them on a wet hide string, which, being stretched slightly and having knots tied closely, was allowed to dry, whereby a number of beads were firmly held together, when the whole string was rubbed back and forth on a stone until all had the desired shape, not unlike the shaping of wampum, referred to by John Lawson, except that here the beads are collectively ground for the purpose of saving both time and labor.

Wampum beads are found in graves in many parts of the country in considerable numbers; yet there is reason to doubt, where large quantities occur, whether they do not belong to a time subsequent to the advent of the whites on the continent rather than to an earlier period. No matter how the Indian bored shell beads, within the limits of the tools possessed by him they were difficult to pierce, as Schoolcraft has shown. "The old wampum," he says, "was indeed a rude article, and the labor of making it by hand, without the use of iron and steel instruments, made it very costly before the discovery. The Dutch

¹ C. C. Jones, "Southern Indians," p. 292; Gates P. Thruston, "Antiquities of Tennessee," p. 299.

introduced the lathe in making wampum, polished and perforated it with exactness, and soon had the monopoly of the supply for the whole Indian trade. Wampum was also called by the Manhattanese "seawan," and Long Island, which yielded the crude shells abundantly, was hence called Seawanacky, or land of seawan shells. By the more northern tribes who spread over New England this treasured article was called peag or wampeag."¹

Experiments made by Dr. Charles Rau, of the Smithsonian Institution, which are described in his valuable paper on "Drilling in stone without metal," were among the earliest investigations into the aboriginal methods of drilling with the pump drill. Yet, the time which it required this well-known archæologist to perforate a block of diorite with a hole $1\frac{1}{4}$ inches in diameter, demonstrates that much was yet to be desired, although the experiments were highly interesting as well as instructive. The experiments made by Dr. Rau were with an extremely rough pump drill, built, according to Morgan's description, of what he calls the fire drill of the Iroquois.

Experiments made with the different drills appear to add some data to that already possessed concerning the mechanical methods of early races and the development of the drill. When possible, the experiments have been made with the identical implements still used by the American Indian, and with such other tools as the use of these suggested, and, in one or more instances, with drills which have been described by Egyptian pictographs. Various points have been used on the drill shafts which were suggested by specimens in the U. S. National Museum. While the experiments probably leave much to be desired in the art of drilling, they certainly indicate that drilling was much less difficult work than has generally been supposed, and solve some problems in this work which do not heretofore seem to have been understood.

Archæologists have made experiments as to their ability to perforate a particular bone or stone instead of making a general investigation of the principle of drilling. That there were different tools and ways of drilling has been referred to in a cursory manner, but does not appear to have had any special significance attached to it, nor do either the points or sands used appear to have been considered, although the cutting material or point is at times quite as important as the drill employed.

It has even been asserted that to bore such holes as are perforated through rock crystal by certain natives of the Rio Negro, requires the lifetime of two persons for their completion.² Such assertions are commonly accepted and are too often quoted without due consideration of the probabilities of their being accurate. It is difficult to prove a negative, yet in this instance, in view of what we do know of the method of

¹ Henry R. Schoolcraft, "Notes on the Iroquois," Albany, 1847, p. 357.

² Edward T. Stevens, "Flint Chips," a guide to the Study of Prehistoric Archæology, as Illustrated by the Collection in the Blackmore Museum, London, 1870, p. 96.

such work, we can do so with reasonable certainty, for the author says it is done by twirling the leaf shoot of a plantain with sand and water. It is known that such twirling would cut the hole of the indicated size in a comparatively few days with the proper abrading tools or material. Even with quartz sand the work would require but a few weeks, though engaged in only during the leisure hours of the workman. In countries where the population has settled homes, and where society is organized and trades are developed, it is rare indeed that the life of a man is the span of any accomplishment, but more particularly of making any single implement; that such a thing would ever occur in an unorganized society appears nearly incredible. That a savage should sacrifice a year or even a month to complete a given piece of work, would occur only in rare instances. The exigencies of life among savages and barbarous peoples would negative any theory of the requirement of a considerable period to complete any article intended only for luxury or adornment.

That man would devote the greatest care to the perfection of work in making a weapon is self-evident, for during the age of savagery life would only too often pay the penalty of carelessness either in choice of material or workmanship. In the hunting field with wild beasts, or in struggles with a human enemy, the superiority of arms and material would forcibly impress one with the fact that the better the weapon, the more certainty there was of its accomplishing the purpose for which it was intended. It is found that, so far as experiment teaches, it is a safe rule to assume that no savage implement ever required any considerable time to complete. In boring holes in even the hardest minerals, such as quartz crystal or jade, it is found that but little time was required when the work was begun in a proper manner, and this accords entirely with the well-known habits of savages. Travelers who have visited countries whose people have not come in contact with civilization are often led into inaccuracies in describing their experiences. This may be caused in several ways but in none more readily than by not properly interpreting language. The drilling of rock crystal, because of its hardness, is a matter of some difficulty even where emery is used, and a person not familiar with the language, or unfamiliar with the process, might readily be led astray, unless they observed the work with great care. To see one rolling the point of a shaft back and forth upon a stone, which the observer knows to be extremely hard, and to notice no progress being made in the work and possibly being told by an Indian that the task requires a long time to complete, is calculated to cause one to form wrong impressions. All will concur in the correctness of the expression of the Marquis de Nadaillac in his saying that "Nothing has been more injurious to science than the ephemeral popularity of hypotheses which the revelations of a day have sometimes overturned."¹

The writer imagines that the same feeling which impels a small child

¹ "Prehistoric America," preface, p. vii.

to pick up a smooth pebble on the beach has something to do with the fondness of adults, either savage or civilized, for similar things. To the savage a bear's claw, an elk's tooth, or the talons of an eagle are evidences of skill expended or bravery shown. The civilized man may preserve the shell, as he certainly does the pearl or the gold nugget set to adorn his person. The differences in society establish the values of jewelry, and the scarcity of an object makes it as attractive to the one race as to the other. Throughout all periods and conditions man appears to have entertained a lively appreciation of the colors of the rainbow, the gay plumage of a beautiful bird, the grace of the cat tribe, the viciousness of the wolves, and the beautiful lines in nature. There is in the human being an instinctive appreciation of beauty and fitness which is not shared by any of the animals. Fashions change continually and there are many instances of an article, common at one period but subsequently quite forgotten because of its disuse, which after a lapse of ages has again appeared, possibly as the result of an independent discovery.

One of the most noticeable instances of this kind is the fibula of bronze used by the early Romans and Greeks, if not by their predecessors of Assyria and of Egypt, which went into disuse, and now reappears in the safety pin. The general use of the button, its comparative cheapness, its greater handiness and less likelihood of being lost, was well calculated to drive out the use of the ancient safety pin, or fibula, as it is called.

To perforate a hole in a piece of hide with a pointed implement is, it must be admitted, as old as the time when man first killed animals. When man first pressed a splinter of stone, or bone, or shell, or even a thorn, against a softer substance with sufficient force to make an incision, the art of drilling may be said to have begun. Such an accident must have marked one of the first steps in the evolution of the tool which we now call a drill, and which at present may be run by steam or electricity, and is pointed with precious stones and works at the rate of some thousands of revolutions per minute. This latter tool is capable of perforating a hole with a rapidity which would have appeared incredible to one who had no knowledge of high mechanical power. The ability to drill is limited only by the ability to produce an article of equal or of greater hardness than the object intended to be perforated. If the perforator is no harder than the object intended to be perforated, the wear is slow and tedious; if the object is, however, softer than the drill point, the process becomes a cutting one, and the work progresses according to the hardness of the materials and number of revolutions of the drill in a given time. Man could not fail soon to learn to perforate holes in articles of varying hardness from his desire to attach them to the person to prevent their loss.

While it would be unsafe to say that all the methods of drilling are known, it may be said that the general line of difference and modifica-

tion of the drill may be traced with as much accuracy as the evolution of any other known tool or machine can be.

Sand or some hard substance is the cutting material and the revolutions of the drill are the means of causing the cutting. The hole bored is necessarily of greater diameter than the size of the drill dependent upon the size of the sand employed and the quantity kept in the drill hole. Soft copper, from its tendency to bed the sand, is a better material for the drill point than a point of greater hardness would be, upon the same principle that the modern lapidaries use the softest iron in connection with sharp sand or emery to cut the hardest stones. By allowing the sand to accumulate in the perforation at the point of junction of the drill holes in the middle of the object bored, or wherever the two perforations meet, it will soon wear the hole to a uniform size. Making the hole of equal size throughout by drawing a stick or stone back and forth is easily done.

Nillsou bored an eye in a bone needle by twisting a splinter of stone backward and forward until the perforation was complete. The material and processes which the writer has employed he has endeavored to explain fully, in order that if there be any doubt felt concerning the experiments, the statements may be substantiated or disproved without trouble, and that the reader may be enabled to draw his own conclusions. It is admitted, however, that there still remains much which does not appear satisfactory regarding objects bored by primitive people in different parts of the world.

The writer has not intended to assert that these experiments develop the forms of all primitive drills, but it is submitted that with one or another of these tools any perforation found in American or European stone implements may be readily duplicated. There may be minutiae of work which have been observed by others but which have escaped the notice of the writer, though it is believed that they are few.

Stone implements, no matter where found, may be bored by any of the drills herein described, provided the proper point be used on the drill, though the character of drill will always be governed by the size of the perforation it is desired to make. Any drill which has sufficient rigidity to support the shaft, no matter how slender it may be, which is capable of being turned, fitted with a point of wood or other substance, can be made to cut any material which the point or sand used will scratch. The rapidity with which the drill revolves and the hardness of the stone which it is intended to bore, as well as the pressure applied to the drill, governs the length of time required to perforate any stone.

To this proposition there will be found few, if any, exceptions, except as to pressure, which may be so great as to crush the abrading material.

All people must be anxious to save labor on whatever work they may be employed, and wherever stone implements are found a careful examination will develop the correctness of these views. Flint, because

of its texture, is most difficult to bore, and even were it perforated and hafted, could not have accomplished the same work which the battered ends of hammer axes show that these hammers performed, for the simple reason that a severe jar would break the flint to pieces. Basalt and diorite appear to be peculiarly adapted for pounding and being pounded without damage, which, if done to a flint, would quickly terminate its usefulness.

The cutting power of corundum is very great, being next to the diamond in hardness, and therefore superior to quartz sand; and for this reason, where the stone to be cut is harder than quartz, or even of the same hardness, emery would be the more valuable cutting sand. Emery is found in several parts of the North American Continent, and in vast quantities in the Grecian Archipelago, and is said to have been imported by the Phœnicians into Egypt at a very early date.¹

PINS, BODKINS, NEEDLES, AND AWLS.

Since man first began his wanderings over the face of the earth, and went beyond the limits of the torrid zone, he would have made use of clothing during inclement weather.

To prevent the covering falling from his shoulders, it would be necessary that it should be held in position either by thongs tied around the body or by means of pins thrust through the material, which would serve the same purpose.

It is quite doubtful whether we yet have evidences of a time when the earliest races did not possess pins, bodkins, and needles. The thorn from a bush, a dead limb of a tree, the splinters struck off by lightning, the spines furnished by certain shells, as well as the naturally or artificially pointed bones of birds, animals, or fishes would furnish an abundance of material wherever man might wander. Deer antlers, porcupine quills, the points of the tusks of the narwhal, and the teeth of many animals would supply natural awls.

It may be noted as an axiom regarding all tools of savage or of civilized races that they are employed for all purposes for which they can be made serviceable. In the caves of Europe at times there are found pins of ivory or of antler, having carefully formed heads, the whole tool being scraped or ground into shape. Pointed bone bodkins are found in the quaternary layers of the caves of England and of the continent, as well as in the earliest remains of Asia and of northern Africa, and in the lake houses and shell heaps of the world. Nowhere does the bodkin play a larger part in the daily life of a people than among the Eskimo, yet it is a no less important article among people of a more southern latitude. The bodkin was employed in sewing, in tattooing, in net making, for moving or untying knots; it was employed in basketry work and in house building, in sewing or lacing the rushes

¹Perrot and Chipiez, "A History of Art in Chaldea and Assyria," London, 1884, II, p. 260.

or grass together. These implements vary in size from diminutive needles, which would only be suitable for carrying threads through holes already perforated, to implements a foot or more in length which would be formidable thrusting weapons. The bone awls in the collection of the U. S. National Museum are quite numerous, and certain specimens from Troy, presented by the wife of Dr. Henry Schliemann, the distinguished archæologist, appear to have been bored by means of a splinter of flint held between the thumb and index finger,

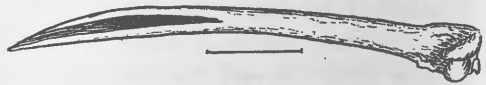


Fig. 53.

AWL MADE OF WING-BONE OF WATER FOWL.

Bristol Bay, Alaska.

Cat. No. 49181, U. S. N. M.

and turned back and forth until the bone was perforated, and, we may imagine, are not unlike the needles of the Virginia Indians, "made of the leg bone of a crane, for sewing together the mats of which their houses were built."¹ The Natchez Indians are said to have used awls for sewing, made of small, thin bones which they took from the legs of herons.²

Fig. 53 shows an awl made from the wing-bone of some water fowl, having a long and extremely sharp point, carefully ground to the proper form, making the implement commonly employed by the Eskimo of Bristol Bay, Alaska; yet it is very similar to just such an implement from the lake dwelling of Meilen.³

Fig. 54 shows a woman's bodkin from Cape Nome, Alaska, used for slipping knots. The specimen is quite a work of art, made from walrus ivory, having a gradually tapering and elongated sharp point. The base of the implement is carefully bored through, for the purpose of having a cord attached to it to prevent its loss, as scissors are often tied by a string and suspended from a belt for convenience of use. The cross section of this bodkin is triangular, and is as gracefully made as one could desire such an implement to be.



Fig. 54.

WALRUS IVORY BODKIN.

Cape Nome, Alaska.

Cat. No. 45259, U. S. N. M.

Fig. 55 shows a bodkin from Kotzebue Sound, made of walrus ivory, and shows how a broken tool will often be adapted to other purposes. It is made from the broken end of an old drill bow, being scraped to a point at the sharp end, while the opposite extremity has rudely carved upon it the head of an animal, probably intended for a seal.

¹ Thomas Morton, "New English Canaan."

² Charles Gayarre, "Louisiana," New York, 1851, p. 296.

³ Keller, "Swiss Lake Dwellings," pl. III.

The ivory has been scraped down to answer its new purpose, leaving the original etchings of the bow drill only partially obliterated. Such bodkins are of every conceivable shape, from the crudest imaginable to the most elaborate.

The specimen shown in fig. 56 is also of ivory, but here we see such an improvement in shape that it might be taken for the tool of a civilized workman.

The point is reenforced by a wooden handle into which it has been fitted in a mortised socket, and by a lashing of seal thong is made as firm as could be desired, for the splicing is as well done as it could be with steel tools. This is a man's implement, used in slipping knots, that shown in fig. 54 being a woman's implement. Each is used in net making. This specimen is also from Cape Nome. Tools of this character are often most elaborately ornamented, and there are evi-

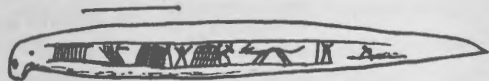


Fig. 55.
WOMAN'S BODKIN OF WALRUS IVORY.
Kotzebue Sound, Alaska.
Cat. No. 48553, U. S. N. M.



Fig. 56.
AWL MADE OF WALRUS IVORY AND WOOD.
Cape Nome, Alaska.
Cat. No. 44385, U. S. N. M.

dences that the Atlantic Coast Indians used similar implements at the time of the arrival of the first settlers.

Fig. 57 shows an advance over the simpler form of awl, yet is most primitive as an implement, but shows the appreciation of the native Alaskan of the comfort to be derived from a handle, as well as a knowledge of the increased power which a handle gives to such a tool. A deer horn of proper dimensions has been selected for this handle, into which a hole has been cut to receive the point of bone, which has been firmly driven into it. This instrument, which is from Point Barrow, is strong and serviceable. There is an object similar to this in the Museum of Natural History in New York City. An advance in some respects on these tools is a specimen in the collection of the University of Pennsylvania, which has a bone handle with a copper point driven into it, and in the collection of the U. S. National Museum there is a large number of copper points which would answer the same purpose, or might be used as drill points.



Fig. 57.
AWL WITH BONE POINT
AND DEER-HORN HANDLE.
Ooglaamie, Alaska.
Cat. No. 89521, U. S. N. M.

These bodkins are not always confined to bone and ivory in Alaska, for the U. S. National Museum possesses several fine specimens which have been made from a compact green nephrite, one of which

is shown in fig. 58. They are made by sawing a slab from a piece of the mineral and subsequently grinding it into shape, after which the eye is made by a sawing process. Through the eye a cord may be run and the

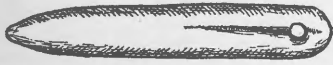


Fig. 58.

NEPHRITE NEEDLE.
Sledge Island, Alaska.
Cat. No. 44920, U. S. N. M.

implement used for sewing. The more valuable a small tool may be, the more certainty exists that it will have a hole through it, presumably for the purpose of a cord being attached to it, which greatly decreases the chance of loss. The hardness of nephrite makes the grinding and polishing of the stone a somewhat slow process, although quartz sand cuts it with facility. Ernest Chantre presents the figure of an awl from the station of Gresine, a pile dwelling in Savoy, very similar to the object referred to in the Museum of the University of Pennsylvania, the specimen from Gresine having a wooden handle with a bronze point.¹

Fig. 59 shows an ornamental awl from Alaska, with an iron point in an ivory handle, making, with its blackened marks so common among the ivories of the Alaskan Eskimo, a most ornamental and graceful implement, which in shape is not unlike awls of the early Bronze age of Europe, one of which was found at Loch Spynie, Scotland, in a shell heap. Similar implements might be found with any savage tribe which had trade relations with others who traded with the whites, an instance of which is referred to by Mackenzie, who says:

From the adjoining tribes, the Red Knives and Chipewayans, they procure in exchange for marten skins and a few beaver, small pieces of iron, of which they manufacture knives, by fixing them at the end of a short stick, and with them and the beaver's teeth they finish all their work. They keep them in a sheath hanging to their neck, which also contains their awls, both of iron and horn.²

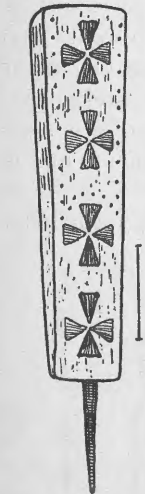


Fig. 60.

IRON-POINTED AWL
WITH BONE HANDLE.
Nebraska.

Cat. No. 22455, U. S. N. M.



Fig. 59.

IRON-POINTED AWL
WITH IVORY HANDLE.
Alaska.

Cat. No. 67873, U. S. N. M.

Schliemann refers to finding a gimlet of bronze at a depth of 8.50 meters at Hissarlik, and speaks of it as one of the most interesting objects found in his excavations of 1882, and says it is more remarkable that it was found in the temple of the second city.³

¹Ernest Chantre, "Age du Bronze," pl. 63.

²Alexander Mackenzie, "Voyages from Montreal through the Continent of North America," 1802.

³H. Schliemann, "Troja," New York, 1889, p. 99.

Pins of bronze from the dimensions of a good-sized sewing needle to those tools with almost a square cross section 8 or 10 inches long by a diameter of one-fourth of an inch or more (the uses of which it is difficult to determine, as they might be awls, pins, daggers, drill points, or chisels) are found in Assyria and Egypt. Bronze, because of its greater hardness, would, when it was obtainable, be naturally preferred to bone, ivory, or wood.



Fig. 61.

MANNER OF USING HANDLED AWL.

The bronze pin from Loch Spynie, referred to by Sir John Lubbock, from a shell heap,¹ might be of any age, for, while the implement is of bronze, fig. 59, of bone, from Alaska, is of the same general character. Fig. 60 represents an Otoe (Siouan) awl from Nebraska. The square handle of deer horn is highly polished and artistically ornamented with four crosses on each of two sides opposite each other, while the other two sides are ornamented with lines and dots. This awl is said to be used for sewing with twine and embroidery, though it is yet the chief perforating tool of the Otoes, as the writer was informed by a member of the tribe. This Indian, one of the chiefs of a delegation at Washington, was evidently ignorant of the bow, strap, and pump drills, and brought others of the delegation to see them worked; and when asked with what tool his people made holes in things, said "the awl." The point of the implement here given is of iron, which is firmly driven into the handle; and with such a tool a hole may be worked in most substances by turning it back and forth, the implement being held as represented in fig. 61.



Fig. 62.

SHOEMAKER USING AWL.

From a figure by Wilkinson.

No implement can be more simple than this awl without a handle, which we have seen is found in the most ancient dwellings of man the world over. The most ancient representation of one using this tool is shown in fig. 62, taken from Wilkinson's illustration of the Egyptian leather worker, who sits on his three-legged stool and pierces the object upon which he is at work.²



Fig. 63.

AWL MADE OF ANTLER, USED BY THE SWISS LAKE DWELLERS.

From a figure by Keller.

Fig. 63 is from Keller's excellent work on "Swiss Lake Dwellings," and represents a large awl made of antler, though it would answer most excellently as a dagger.

¹ Sir John Lubbock, "Prehistoric Times," p. 177.

² Sir J. Gardner Wilkinson, "The Ancient Egyptians," 1854, II, p. 105.

The attachment of a handle of any hard substance to an awl gave to it an enormously increased power over any blade held in the unprotected hand, and the handle, by being of a convenient size to fit the hand, enabled a person to work with it continuously for a much longer time than could possibly be done with the unhafted tool. This implement is the parent to the gimlet.

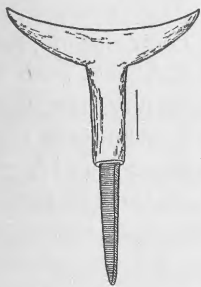


Fig. 64.

CROSS-HANDLED BONE AND
IRON AWL.

Ungava, Labrador.

Cat. No 90158, U. S. N. M.

To make an awl of primitive shape required no skill; a piece of wood, or of bone, or of ivory, or of deer's antler was all that was needed. By grinding these substances against a stone, or by scraping for but a few minutes, the tool was made. It required no inventive genius, but was simply an imitation of a tool which is spontaneously supplied by nature in so many forms that it appears useless to enumerate them further.

A handle as represented, however, did not exhaust the possibilities of the awl, for its penetrating power was increased greatly by a change of handle from one perpendicular to the blade to one at right angles to it. Deer antler was just suited to such work and was obtainable in most localities, and would be employed when the necessity arose, as it did with the use of metal.

Fig. 64 shows such a tool from Ungava, Labrador; and it will be appreciated that such a handle made the awl a tool upon which the full strength of one arm could be exerted much more easily than could be done with the more primitive instrument. So long as the awl was made of bone, ivory, or stone, a cross handle was nearly, if not entirely, useless, as a man's strength would too easily twist the blade from the handle. When, however, hard metal came into use, then the necessity for more power would be quickly appreciated, and the cross handle would be adopted. Fig. 65 shows how this tool would be held in the hand. It may be regarded as the forerunner of the cross-handled auger. The point of the specimen figured is of steel.



Fig. 65.

CROSS-HANDLED AWL IN
USE.

Cat. No. 90158, U. S. N. M.

In working the awl, each turn of a two-edged tool makes one-half of one complete revolution, as the implement is turned to the right or left, and with a three-edged tool the revolution would be almost complete, but worked in the most satisfactory manner it could hardly make 100 complete turns per minute. A three-cornered blade to an awl makes a very good tool for reaming out small holes, when it is desired to increase their surface dimensions.

The handles of such tools may be attached in several ways. Among

those noted in the U. S. National Museum may be mentioned driving the blade into the handle, wedging it in, mortising and wedging, splitting the handle and fitting in the point, and subsequently binding the handle with rawhide and allowing it to tighten in drying; also, it is seen that a square hole is at times cut to fit a similarly shaped point which would fit neatly and wedge itself, as well as dove-tailing.

Glue made from the tips of deer horn was used by the Indians of Virginia, and bitumen was extensively employed by the natives of California for attaching points of various kinds to thin shafts.

A step in advance from a splinter, sharp at one or both ends, to the awl or bodkin, with a natural handle furnished by the knuckle bone of some animal, is but slight, yet what greater advance upon this primitive tool has civilization made?

DRILL POINTS.

In describing the points of drills and other perforators, it is necessary to preface the remarks by saying that while, in a given locality, there may be a supply of suitable material abundantly furnished by nature, there may well be other localities where material fitted for drill points would be exceedingly scarce. As a consequence, when a large tract of country is considered with regard to its supply of material suitable for furnishing drill points, investigation will seldom fail to furnish examples of practically every substance having been utilized for drill points which that country produces, and not infrequently materials will be found to have been employed that one at first would hardly have thought suitable.

The points of primitive drills and perforators may be said to act in different ways, depending upon the hardness of the point in the first place, and, secondly, depending upon the hardness or density of the material against which the point is brought into contact.

A dried thorn or pointed bone when brought into direct contact with a skin will perforate it without the necessity of applying any very great pressure, whereas, were the hole to be made through wood, it would require a hard point to be pressed against the wood and turned backward and forward while being pressed until the perforation is completed. The point used would therefore depend largely, if not entirely, upon the character of the material supplied in that locality.

It may be set down as an axiom that any material which may be scratched by any other substance can readily be cut or perforated by a proper use of such abrading substance; as a consequence, points for awls, drills, and similar implements are found to cover a very wide range of vegetable, animal, and mineral material, from wood to corundum. Whether it be the wooden point of an arrow, the spur of a bird, the bone of a fish, or a point of stone or metal, or some sand which is used, the case is the same. Man, appreciating the necessity of boring

a hole in a given substance, will quickly find a means of accomplishing his purpose.

The accompanying figures of points must not be regarded as comprising a complete list of all the examples in the collection of the U. S. National Museum, but are designed rather to convey an idea of the typical characteristics of different points and the chief features of the holes which they would be suitable for making. It should be noted that



Fig. 66.

FLINT POINT OR PERFORATOR.

France.

Cat. No. 99604, U. S. N. M.

because a specimen is referred to as a drill point, there is no intention of suggesting that such was its exclusive use, nor that such a point on a given tool was to be considered as a requisite of such tool. Upon occasion a stone or wood point might be directly held between the thumb and index finger and used to perforate a bone, or it might be used as a graving tool, or as the

point of an arrow, a knife, or a scraper, or possibly for a dozen other purposes which would occur to the reader. The writer will endeavor to confine his suggestions concerning these points to the uses for which he has found them practicable in his own experiments, or to quotations of such uses as have been attributed to them upon occasion, by those collecting them among the people who used them, or to references made by authors as to the employment of drills by races or tribes whom they have visited. The correctness or inaccuracy of quotations and conclusions may be proved by testing references made.

Fig. 66 shows a typical so-called perforator from the cavern of La Madelaine, Dordogne, France, and similar implements are not uncommon in other European caves. It is simply a spall of flint with a very slight secondary chipping at the point. This point, if one considers its boring capacity, will be observed to be extremely short, and could be suitable to drill only such objects as shells. It would be too short even for an ordinary bead. Any pointed and unshaped spall of flint would answer the purpose much better, whether held in the hand, or hafted, as in fig. 61, though European archaeologists are inclined apparently to the former theory. The point in fig. 66 would answer infinitely better, and from its shape is better suited for cutting lines on bone or ivory, of which many specimens are found in the caves, than it would be for a boring tool of any character. The writer has met with some American arrows having a similar point, though they are quite unusual.

Fig. 67 represents a perforator of jasper, from Log Creek Valley, Orange County, Ind., having a nearly triangular cross section, upon



Fig. 67.

JASPER DRILL POINT.

Indiana.

Cat. No. 32383, U. S. N. M.

which there is little secondary chipping, the three sides presenting almost plane surfaces. This form is not uncommon, though the same would have to be said of most drill forms. Drill points of jasper having at times secondary chipping with almost triangular cross sections are quite as often seen. The shape here referred to is known not only in England,¹ but is said to be also a Syrian type.²

Fig. 68 shows a Georgia specimen, but the form is quite common elsewhere in the United States. Specimens of this character are usually of a compact jasper or of a tough quartzite suitable for boring any substance not harder than indurated clay.



Fig. 69.

JASPER DRILL POINT.

Indiana.

Cat. No. 32400, U. S. N. M.

The specimen shown in fig. 69 is also a perforator from Log Creek Valley, Indiana, and may be described as the typical wood-boring tool common to the northern continent, for which purpose this shape is more suitable than another, yet if carefully manipulated as a point to a shaft worked perpendicularly between the outstretched palms of the hands it would perforate quite hard sandstone, or possibly even a syenite. This form of tool, however, when used as a point to a pump drill, a strap drill, or a bow drill, even though manipulated with the greatest care, is almost certain

to snap in two pieces after perforating one-half inch in depth in stone. If this form of point is used in boring indurated clay or steatite, however, it cuts quite rapidly. It will bore through an inch of wood in from three to five minutes, depending upon the velocity of the drill. To bore a hole in a block of steatite of similar depth would require very little more time, the difficulties increasing in proportion to the increased hardness of the substance bored. So soon, however, as the drill point becomes loose, the danger of breaking the point rapidly increases, because of the irregularity of pressure upon the point caused by the working of the point on the shaft.

Fig. 70 shows a Kentucky specimen, common to



Fig. 68.

JASPER DRILL POINT.

Georgia.

Cat. No. 31923, U. S. N. M.



Fig. 70.

RIOLITE DRILL POINT.

Jewett, Kentucky.

Cat. No. 6155, U. S. N. M.

¹ John Evans, "Ancient British Stone Implements," p. 289, figs. 228, 235.

² Anthropological Institute of Great Britain, I, pl. xcvi, fig. 5.

the two Americas, from Canada to Patagonia, and all intermediate points. Specimens of this class are usually of a riolite in Maryland, and at times, although very seldom, of quartz. The broad base of such a tool could without difficulty be held between the fingers, though it would probably be bound to a shaft and revolved between the hands, being of a very suitable shape for boring wood.



Fig. 71.

HORNSTONE DRILL
POINT.

Kadiak Island,
Alaska.

Cat. No. 27548, U. S. N. M.

Fig. 71 shows a hornstone point from Kadiak Island, Alaska, which has a ground point of the shape of a chisel blade, though the body of the implement is perfectly smooth and round, as though it had been worn by being revolved in some hard stone for a considerable time, so that it makes it difficult to say for which purpose, as chisel or as drill point, it has been most used, as its shape is equally suitable for either purpose.

Fig. 72 shows a jasper wood-boring point from Wisconsin that also is of a very common American type, the length of which would insure its breaking with slight pressure in the hands of any but a most skillful workman. It should, however, be said that, as the American drill was only a straight shaft worked between the palms of the hands, a thin point could be worked safely, whereas a similar point would be broken if employed upon any of the drills with higher velocity than the hand drill.



Fig. 72.

JASPER POINT FOR DRILL-
ING WOOD.

Wisconsin.

Cat. No. 31394, U. S. N. M.

The mineral of which these drill points are made is commonly jasper, though those of quartzite are at times quite as numerous. Jasper being usually of tougher texture than quartz, makes a more durable material from which to make drill points. Riolite was used to a certain extent, and in Alaska points of nephrite are at times met with. Among the Pueblos chalcidony furnishes material for points of the pump drill, which they so commonly employ at present.

In fig. 73 is shown a compact, white, close-grained quartzite from California, which has been shaped by chipping, and is suitable for boring objects not harder than banded slate or catlinite.



Fig. 73.

QUARTZITE DRILL POINT.

California.

Cat. No. 167340, U. S. N. M.

In fig. 73 is shown a compact, white, close-grained quartzite from California, which has been shaped by chipping, and is suitable for boring objects not harder than banded slate or catlinite.

Fig. 74 shows a comparatively thin-bladed, black, jasper point of an Alaskan implement, which in its handle, to which it is yet attached, looks more as though it were a cutting tool, knife, spear, or dagger than a drill, as it is catalogued by Mr. Nelson, who collected it, and who has had great experience in Alaska, and possesses an intimate acquaintance with the mode of life of the Eskimo who used it.

In fig. 75 is shown a chipped jasper point with a much greater cross section than the preceding specimen. This point was also obtained from Alaska, and would answer as a dagger or thrusting implement.



Fig. 75.

JASPER DRILL POINT.

Alaska.

Cat. No. 89628, U. S. N. M.

The specimen shown in fig. 76 is said to be a drill point of compact dark red stone with an almost square cross section, the point of which has been carefully ground into shape. This implement one would suppose to be made for use as a chisel, were it not that it is also in its original socket, which is that of a shaft belonging to a heavy drill, and shows on the shaft deep wear where it has been worn by the head piece of a strap or bow drill.

The specimen shown in fig. 77 is, in all probability, a drill point, judging from its heavy cross section, which would unfit it for almost any other use, and is from the California coast, where numerous stone implements with large perforations are found. The specimen appears to be more cumbersome than any of the other points heretofore referred to.

Fig. 78 shows a drill point, unique in its character, from Santa Barbara, Cal. It is composed of a light gray siliceous sand combined with fine shell, making a stone peculiarly fitted for boring the hardest substances. These drill points are circular in their cross section and unusually thick in proportion to their length. They vary from an inch in length, with a diameter of three-fourths of an inch, to the largest specimens, which are 4 inches or more long with a diameter of $1\frac{3}{4}$ inches. There are a number of these drill points in the New York



Fig. 74.

THIN BLADE OF BLACK JASPER.

Alaska.

Cat. No. 89630, U. S. N. M.

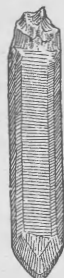


Fig. 76.

DRILL POINT OF RED STONE.

Alaska.

Cat. No. 55941, U. S. N. M.

Natural History Museum, some of which are yet attached to their original handles, leaving no doubt of their use as hand drills. They are attached to their handles by bitumen. Numbers of these objects come from San Miguel Island, California, and have handles 14 inches or more in length. While many of these drills are yet in perfect condition, there are naturally very many more whose handles have decayed entirely, leaving bitumen still attached where the wood has rotted away. Yet there are some specimens presenting the apparent anomaly of having bitumen on both ends. The only solution which appears to offer itself for this peculiarity is that the points after they have worn a certain distance have been turned end for end. But this does not explain the occurrence in a satisfactory manner, for there appears no reason for the necessity of turning them, and as experiment has not been made with this material, nothing can be said of any peculiarity of wear which might possibly explain the matter. This class of implement is similar in outline to stones found over a large portion of the North American continent which are called



Fig. 77.

STONE DRILL POINT.

California.

Cat. No. 21749, U. S. N. M.

“plummets,” though these plummets, as found in the eastern portion of the United States, are usually made of a compact quartzite. A plummet in the U. S. National Museum from St. Croix, Me., is polished over its

entire surface, whereas a similar specimen from Maryland in the writer's collection is merely pecked into shape and remains in its crude condition, the marks of the stone hammer never having been ground away. As, however, no stone implements with perforations, such as would be made by a similar tool, appear on the Atlantic Coast, the writer would hesitate to suggest that they were used as drill points. Were they so used, it must have been for boring holes in wood.

The last two specimens were beyond doubt drill points, and one may say that the one shown in fig. 78 was the tool used in perforating stone balls, such as are represented in fig. 26. The composition of the shell and sand in this stone adapts it excellently to drilling purposes, especially if used with water. The stone point being held in the shaft by bitumen,

the savage would squat on the ground, holding the object between his feet, and by revolving the shaft between his extended palms would perform the work. This method of working a drill was equally adopted by all races in temperate climates, where the foot is

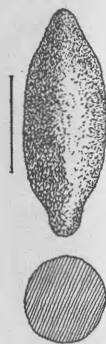


Fig. 78.

CYLINDRICAL DRILL
POINT OF SILICEOUS
SAND AND SHELL.Santa Barbara, Cal.
Cat. No. 20412, U. S. N. M.

Fig. 79.

REED DRILL
POINT.

brought into play to aid the hands, as is seen in wood-turning in eastern countries.

A plain, round, wooden point of a drill shaft one would suppose to be of little service, yet experiments indicate that such a point is as serviceable with the aid of sand in drilling holes as any of the other points heretofore referred to.

At the present time long sharp points of iron or steel driven into a wooden shaft are used as drill points by the Japanese carpenter. Bone points may be ground to perforate soft wood; tubular points of elder or of reed, as seen in fig. 79, driven on a shaft of wood, make most excellent drill points when used with sand, provided it be kept dry. In the same manner, pieces of horns have been made to answer the purpose, though the flange of ordinary horns would not recommend itself where other material was available.

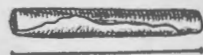


Fig. 81.
TUBULAR DRILL POINT OF
COPPER.
North Carolina.
U. S. National Museum.



Fig. 80.
TUBULAR DRILL
POINT OF COP-
PER.

In fig. 80 is shown a copper drill point such as the writer has often employed, made by battering a nugget of native copper into a plate, by means of a quartzite hammer, and then setting the plate on edge on a stone and tapping it with another stone until it assumes a cylindrical form. In hammering this nugget into shape the copper has had beaten into it fine particles of the crystals of the stone, which are firmly embedded into the metal, so that as the copper wears the crystals begin to cut. This implement the writer has found to make a most excellent cutting tool, equal to almost any tried in the course of his experiments.

There are among the copper implements in the U. S. National Museum a large number which appear to have been used as drills. Small hollow cylinders of copper are by no means unusual and are often found in graves of our Indians, belonging, it is believed, to a very early period. The specimens shown in figs. 81 and 82 are from North Carolina and Tennessee, respectively, and while it is very possible that they were beads, they are much larger and thicker than cylinders with which the writer has bored crystallized quartz.



Fig. 82.
TUBULAR DRILL POINT
OF COPPER.
Tennessee.
Cat. No. 82896, U. S. N. M.



Fig. 83.
DRILL POINT
OF COPPER.

A copper nugget being pounded, as before stated, between stones, until sufficiently thin to allow of being hammered into cylindrical shape, will make an excellent point, such as shown in fig. 83. This point being then tightly fitted to a shaft made a most excellent drill point, whether used alone or in connection with sand. The round pins of copper (figs. 83 and 85) were superior in many respects as drill points to any other available material. Because of their strength, points of copper could

be made much longer than would be possible with any other material which could be employed, and such points used with fine sand made a perforating instrument with which holes of almost any required depth or size could be bored through the hardest stones. The other specimens (figs. 84 and 86) are from Wisconsin, and are of a shape that would naturally be used wherever copper was known.

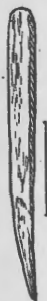


Fig. 84.

SOLID DRILL
POINT OF
COPPER.

Wisconsin.

The modern metal drill point, hammered into shape and ground properly on alternate sides, has been used since a very ancient period, probably as long ago as when bronze was first employed, for the shape would suggest itself as that most suited to cut in revolving. People doing a special work soon adapt themselves to the easiest method of performing it, and naturally learn quickly what materials are best adapted for cutting or for making the drill or other tool, as well as the capabilities of the particular tool upon which they are habitually employed. Large supplies of good material would be valuable secrets to be carefully guarded by those knowing their location, or perhaps profitable possessions where they could be utilized for trade purposes.

The chipping of drill points, like the work upon all other chipped implements, varies greatly in quality, depending absolutely upon the texture of the material worked. At times the chipping will be found almost to rival the beautifully finished Danish tools. At other times the jasper, when tough, as it was desirable to have it when used for drill points, fractures with great irregularity. In riolite, the faces of a drill point may be made often by a single blow of a hammer, only needing a slight secondary chipping with the flaking tool, or it may be if the point is of chalcedony the faces are made with very few blows, requiring no secondary work. Among the Pueblos, as drill points of the pump drill they employed small pointed flakes of stone of so rude a character that the best judge of implements with the liveliest of imaginations would greatly hesitate to declare them tools. The length of copper drill points may be as much as a foot, or less than an inch; those of stone vary from half an inch in length to 4 inches or more, the implements varying according to its use. The diameter of the holes in American implements vary from one-sixteenth of an inch to over an inch, the latter being peculiar to the Pacific Coast, whereas the eastern specimens are seldom over one-fourth of an inch in breadth.



Fig. 85.

SOLID DRILL
POINT OF
COPPER.



Fig. 86.

SOLID DRILL
POINT.

Wisconsin.

To show how material has been adapted to the purpose for which it is most suitable, as well as to call attention to the wide range of drill

points, attention is called to the statement that in Kaiser Wilhelm Land shells fixed in the ends of canes are used for boring holes in other shells and for making shell rings. When the shell of a terrapin is to be bored, it is softened in warm water, flattened and allowed to dry, and then bored by one of these shells.¹ (Fig. 87.)

"Fire sticks and the long spines of *Echini* supplied the Fijian's boring apparatus. With rats' teeth set in hard wood he executed his more minute carving or engraving; and for a rasp or file he still uses the mushroom coral or the shagreen-like skin of the ray fish and pumice stone for general finishing purposes."²

The spine of the *Echinus* varies greatly in size and also in hardness, the specimen (fig. 88) being one of the softer kinds from the Pacific islands. Not only are these spines used as drill points, but are also employed as slate pencils in the missionary schools. On the coast of France the *Echinus* at times makes for itself a cozy bed in the hard rocks of the bottom, where it will work cavities two inches or more in depth with a diameter of four inches or more. These holes drilled in the rock by the *Echinus* have all the regularity and appearance of owing their origin to human agency.

There appears no end to the different material used in one place or another for perforating purposes; among other things, Captain Cook refers to the augers of sharks' teeth employed by the Friendly Islanders,³ and refers also to the New Zealanders using the same tool.⁴ The shark's tooth (fig. 89) furnishes a handy reamer or tool to bore holes in wood when not too deep, while its serrated edges makes it a most excellent saw or knife, and it is of a texture to render it serviceable for any of these purposes.

The Hawaiians had, we are told, rude drills of *Terebra* shells or lava splinters before the advent of iron, but subsequently adopted the triangular file for general use.⁵



Fig. 87.

DRILL POINT MADE OF SHELL.

From an illustration in "Internationales Archiv für Ethnographie," 1888.



Fig. 88.

SPINE OF ECHINUS.
Pacific islands.



Fig. 89.

SHARK'S TOOTH.

¹Dr. O. Schilling, "Der Gegend Finchhafens, Kaiser Wilhelm Land." Internationales Archiv für Ethnographie, Band 1, part 6, p. 222, pl. 9, fig. 9.

²Thomas Williams and James Calvert, "Fiji and the Fijians," New York, 1859.

³Cook, "A Voyage to the Pacific Ocean," London, 1784, I, p. 290.

⁴Ibid., I, p. 189.

⁵Catalogue of the Bernice Pauahi Bishop Museum, part 2, p. 44.

These *Terebra* shells—named from the similarity of their shape to that of a drill—one of which is here represented in fig. 90, are not only strong and sharp on their point, but are most attractive in color, and are highly useful as awls for enlarging holes in skins or moving or untying knots in rope or twine. It is not unsuggestive of the uses to which they may be put to find them, as is occasionally the case, with holes drilled through them with an accuracy equal to any that could be made with a drill of the most improved pattern, which holes are pierced by a small creature, the enemy of the *Terebra*.

At Dos Pueblos, California, there was found in some of the graves small lots of quartz crystals of moderate size, the sharp angles of which were worn away.¹

In fig. 91 is shown one of a number of little crystals found in a small rock shelter in Maryland, not far from pieces of bored pottery made of pounded quartz and clay. These sherds of pottery were bored through probably for the purpose of mending a cracked pot, and the facets of certain of these crystals, of which over a dozen were found, had been broken as though by contact with the crushed quartz in the pottery

“Drills of nephrite or greenstone are frequently found in New Zealand, and as they have to be of the hardest stone, they are generally very beautiful objects. I never find them bearing evidence of having been used to bore holes in stone. I think they must have been used generally for working wood and perhaps bone. We know from various sources that greenstone drills were used for drilling the holes by which the top sides were lashed on the great war canoes.”²

The same author says that Dr. Shortland is the only author who describes the grinding being done by sand alone. He says:

Brunner, in 1846, found at Pahutani limestone rocks containing pure flint, which was carried about as material for boring greenstone; and Rev. Dr. Taylor says that to drill, a Maori ties a small piece of basalt or obsidian firmly to the end of a stick, weighted with two heavy stones; attached to the other end of the stick is a string by which it is made to revolve, and to keep the point of the instrument constantly on the same spot a piece of perforated wood is placed over it.³

Humboldt refers to the cutting of diamonds being invented by Lewis de Berguen in 1456, the art becoming

common only in the following century;⁴ and Keller quotes La Chaux as observing that Guay, to give the last finish to his elaborate cameo of



Fig. 90.

TEREBRA SHELL.
Pacific islands.
Cat. No. 7384, U. S. N. M.

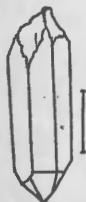


Fig. 91.

QUARTZ CRYSTAL.
POINT.
Maryland.

¹Report upon United States Geographical Surveys West of the One Hundredth Meridian, VII—Archæology, 1879, p. 214.

²F. R. Chapman, “On the Working of Greenstone by the Maoris,” Transactions of the New Zealand Institute, XXIV, p. 503.

³Id., p. 526.

⁴Humboldt's Travels, Bohn edition, I, p. 193.

Louis xv, worked the diamond powder into the minute lines of the work, not otherwise accessible, with the point of a quill,¹ so that, unless Humboldt be mistaken, the cutting of diamonds is historically quite a modern art, and it would be a matter of great interest to demonstrate an earlier use of the diamond as a cutting tool, as possibly it has at times been employed.

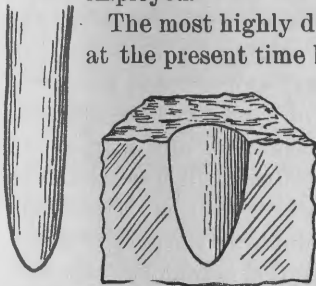


Fig. 92.

WOOD POINT AND DRILL HOLE.

The most highly developed drill for perforating stones used at the present time by jewelers is a solid steel point, having a notch at its end, into which a diamond point is hammered. Yet, notwithstanding that such is considered to-day the perfection of a drill, there is in the collection of the U. S. National Museum an Alaskan drill with a point of bone, having a steel point driven into it exactly as the jewelers at the present use the diamond in a steel point. In order, however, that the apparatus should be made as perfect as possible, after the insertion of the steel point, the latter has been ground down on a stone until the steel appears as a pyramidal point of the bone, and it makes a most excellent tool.

In the Abbott collection of Egyptian antiquities, in the rooms of the New York Historical Society, there are a number of copper or bronze drill points of small or medium size, and in the Cesnola collection from Cyprus there are several others. In both these collections the points of copper and bronze drills are of such variety that it is at times difficult to distinguish drills from chisels or graving tools. Some undoubtedly are drills and others are just as positively chisels, while quite a large number are of such a shape that they would be fit for either purpose.

The holes made by drill points are as interesting as are the points which make them, if not more so, for they present a number of characteristic differences. The simplest form of drill hole is that represented by the wooden point in fig. 92. In boring wood or other material this point is necessarily used with sand, in order to make it cut; if used without sand, it would wear away, according to the texture of the material it was moving on; if a sandstone, it would wear the drill away; if a

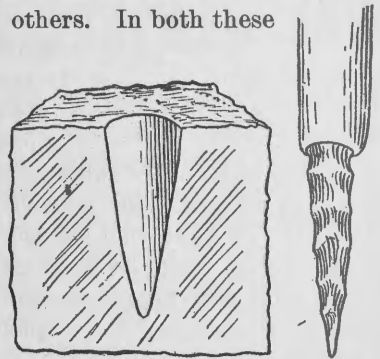


Fig. 93.

THREE-CORNERED DRILL AND HOLE.

¹ Keller, "Swiss Lake Dwellings," p. 25.

smooth stone, it would polish the point of the drill and wear it very slowly. The base of the drill hole, its sides, and its core, if it has one, are all indices of the kind of point employed, even the striæ in the stone show the size of the sand employed or the texture of the drill point, though it is only in exceptional instances that anything may be positively ascertained of the character of the drill with which the hole was made. Should it be intended to perforate wood, however, or stone of medium hardness, a point such as represented by fig. 93 would be preferable, for a drill point made of hard stone would perform its work quite satisfactorily without the use of sand. All available data appears to strengthen the belief that few peoples, if any, were entirely ignorant of the principle of the drill, and almost all used it in some shape, usually the straight shaft; and whatever drill has been used, it has been worked with the best material available for the purpose of making the intended perforation. If the perforation is from both sides and is not more than double the length of the distance to which the point projects from its shaft, it matters little in what manner the point is

attached, whether driven into it, inserted into a split shaft and bound, or attached by gum or asphaltum. This hole in wood, steatite, or even slate, if made with a stone point, would be pointed in a corresponding manner at the base, and the striations of the hole would be distinct and wide apart, and entirely different from a hole made by any of the other points presented.

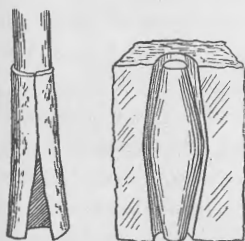


Fig. 94.

TUBULAR DRILL OF SPREAD METAL,
AND CORE.

In the case of such holes as that represented in fig. 40, one may argue with reasonable safety that metal was the means of accomplishing the work, for while other substances may be made to produce such a hole, it would require great perseverance and ingenuity to accomplish it. Although we know that savages do not regard the time occupied by a given task as would civilized man, it is safe to assume that they would not expend more labor upon the execution of a piece of work than was absolutely necessary for completing it in a satisfactory manner.

The sides of a drill hole and the sides of its core being parallel is strong presumptive evidence that the boring was done with a metal tube and little or no sand, for if sand were used it would have a strong tendency to wear the hole at its top, and especially would it wear the core to a point. Such instances are often met with, and when a hollow wood point, or one of reed or elder, is used with sand it leaves only a slight core, unless the diameter of the point is considerable and only a small quantity of sand is employed.

Sometimes, however, cores such as shown in fig. 94 are met with, which are caused by the spreading of the metal drill point shown in the same figure. This point was made by hammering a nugget of cop-

per into shape from cold metal. The surface edges of holes such as these will be found rough, and they usually show that the core is below the surface of the exterior of the hole, which is due to the fact that it is most difficult to revolve a tubular point on the surface of a stone until a socket has been pecked, so as to enable the drill to revolve without slipping aside; the same result would, of course, be accomplished by using a guide for the shaft. The practice of picking a place in which the drill point should revolve, appears almost an invariable rule in all the artificial holes in stone which have come under the writer's observation.

A drill such as shown in fig. 95 would make the hole represented in the same figure. Should, however, the metal spread, it produces the core shown in fig. 94. If we reverse the stone, the same process is repeated on the opposite side, which is caused by an undue amount of sand becoming packed inside the drill tube, thereby causing a tendency to spread the metal. Again, if a metal tube is used with sand, the base of the perforation will not be so narrow as if the metal were used without sand. A reed decreases the proportionate size of the core, a drilled wooden cylinder would decrease it still further, and a tube of elder would leave little if any core.

The drill being withdrawn after perforating halfway through the object, it would naturally be hammered together again, as shown in fig. 95, and the original process of spreading would recur as in the first instance.

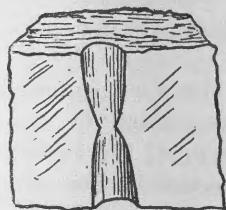


Fig. 96.

INACCURATELY BORED HOLE.

The holes were usually bored, as fig. 96 represents, from opposite sides, and were not always accurate, which was due probably to the carelessness of the workman, for in boring holes through steatite or banded slate to as great a depth as 3 or more inches the writer has found no difficulty in making a continuous line equally as well as has been done in the boring of many of the best museum specimens. When the perforations do not meet with absolute accuracy, a great deal can be done in the final straightening of the perforation by grinding down the inequality with a round stick and a little dry sand.

As to whether it would be more advantageous to cut or bore a hole through a particular stone, must have been a problem presenting but little difficulty in its solution. In the event of the hole which it is desired to make, being much over one inch in diameter, and the stone to be perforated being a steatite or indurated clay, there is little doubt that the person desiring to make the hole would find it most convenient and economical in time to accomplish the task by means of a stone

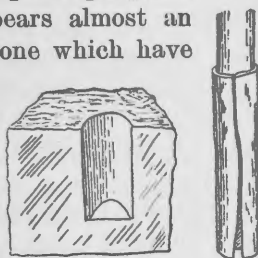


Fig. 95.

TUBULAR DRILL, NOT SPREAD.

pick. Were the stone to be bored through limestone, however, there might be some doubt as to the most economical method of performing the work. It would very possibly depend upon facilities at hand, though, were the perforation to be through diorite, one would find a tube most satisfactory.

Inventions embodying labor-saving devices are quick to be adopted even by savages, and the knowledge of such a machine would quickly pass from place to place, and this would be especially true with such simple tools as drills; and one can scarcely imagine the English, Dutch, French, or Spaniards using any simple drill in the presence of an Indian without his taking in the idea and subsequently utilizing it upon occasion, even if they had not acquired one of foreign make by barter.

If pressure is suddenly brought to bear on the side of a stone point after the stone bored has a perforation one-half inch deep, it is almost sure to snap the point off, as we find the broken points in our fields, where they were probably thrown by their original owners. Were stone points used for drilling stone, it is probable that more would be found with worn points than actually is the case. The accident most common which is most likely to break a stone point in drilling stone, or even hard wood, is the wedging of a grain of sand behind the point of the drill. Either the drill point must press the pellet out, must crush it, or if it does neither, the point is almost sure to break from the sudden and unexpected stoppage of the drill. If a drill point grows loose by the hide lashing becoming wet, the working of the point has a tendency to wear a hole of an elliptical form, and such a hole is likely to prove disastrous by breaking the drill point in the middle.

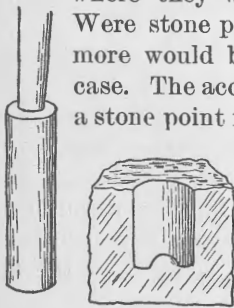


Fig. 97.

DRILL WITH REED OR ELDER POINT.

In fig. 97 is represented a shaft with point of elder, reed, or bored wood, and its corresponding hole, the boring of these points depending largely upon the thickness of the walls of the tube; the thicker the tube, the slower the cutting, because of the increased amount of material which has to be moved, the boring progressing according to the cutting of the sand, which, after all, is the real cutting material when hard stones are being bored. The Egyptians bored shafts on the order of this point, and they require no wedging to hold them in position, as the tightening is accomplished by ordinary pressure. The chief care in boring with a tube is to guard the sand from packing, for if the interior of the tube packs with sand, the core must of necessity be worn down in order for work to progress. The only advantage of a tube over a solid drill is that the tube by cutting a narrow groove leaves a core, which is, of course, a great saving in the amount of material which it is necessary to remove.

If the surface of a stone, which it is intended to drill, be smooth, it is next to impossible to make any drill point remain in position long enough to start the hole, the difficulty increasing naturally with the size of the point. This, as stated, may be overcome by the guide or by sand. The time of perforating a given stone depends entirely upon the hardness of the material to be bored, and the point used. When intended perforations are to be of a large diameter, we see plainly how great was the mechanical ingenuity of the ancients, for here they no longer peck the whole size of the perforation, but work out a narrow, ring-like canal of a diameter to fit the tubular point, and thus prevent its jumping out as the drill revolved in first starting.

A peculiarity observed in boring catlinite was that when there was water and sand in the hole, or even when the drill shaft was only damp, the powdered substance, worn in drilling the hole, adhered to the sides and choked the shaft until it was removed with a knife.

SHAFT DRILLS.

The Eskimo of the Northwest are most skillful in the use of the strap drill and of its near relative, the bow drill. The Pueblo Indians of the southwest are equally familiar with the pump drill, and all employ the straight shaft upon occasion, either as a plain hand drill or as a fire drill. There are so few races which do not know and work the shaft as a drill, that we may be permitted to call this the universal drill.

A reference to early American writings strongly indicates that the North American Indian was at the time of the advent of the whites ignorant of all drills except the plain shaft drill, revolved between the extended palms of the hands or by means of one hand, the shaft being rolled back and forth on the workman's knee.

If this surmise be correct, then, in certain respects, the knowledge will be a valuable aid at times in placing the period of certain of the grave or mound burials on this continent. Mr. Emil Holub, the distinguished African traveler, informs the writer that the natives of south central Africa almost invariably pierce objects by means of a hot iron, which would correspond to the heated copper spindle being used by the American Indian to drill holes in pearls. They also know the manner of producing fire by revolving the shaft.

In most parts of the continent wood or canes grow in sufficient abundance to furnish a supply of material from which suitable drilling shafts may be selected. It has even been suggested that some of the reeds contain sufficient silica to abrade certain stones, and that they are therefore so employed. Experiment does not, however, sustain the latter view. Reeds are of a size to allow of boring with them a hole of one-half inch or more in diameter when worked with sand, and are sufficiently large to cut out a small core.

"The Apache Indian yet bores holes in the most primitive method known. With an ordinary arrow held between the hands and revolved vertically, he bored holes in beads."¹

The Brazilians bore mussels and stones by means of a twirling drill. On a small stick three-cornered little splinters of stones were bound by a string. The shafts were about one-half meter long, and were twirled between the hands. In boring stone sand was used with them.²

Wallace has also been referred to as describing certain drilling, performed by the natives of the Rio Negro in South America, which is of a remarkable nature, though taking what he says in connection with von den Steinen's remarks, and what we know of the American Indian in relation to the drill, we simply see the shaft drill being employed as it was by the people of a large part of the world. Wallace says:

I now saw several men with their most peculiar and valued ornament, a cylindrical opaque white stone, looking like marble, but which is quartz imperfectly crystallized. These stones are from 4 to 8 inches long and about 1 inch in diameter. They are ground round and flat at the ends, a work of great labor, and each pierced with a hole at one end, through which a string is suspended to hang it around the neck. It appears almost incredible that they should make this hole in so hard a substance without any iron instrument for the purpose. What they are said to use is the pointed flexible leaf shoot of the large wild plantain, triturating with fine sand and a little water, and I have no doubt it is, as it is said to be, a labor of years. Yet it must take a much longer time to pierce that which the Tushaina wears as the symbol of his authority, for it is generally of the largest size and is worn transversely across the breast, for which purpose the hole is bored lengthwise from one end to the other; an operation which, I was informed, sometimes occupied two lives.³

Stevens and Lubbock refer to this.⁴ Prof. Flinders Petrie also refers to this work and says it is done with the *Urania amazonica*, and refers to other travelers who said it was patiently rotated between the hands, while the pieces of stone were held between the great toe and the second toe.⁵

Tylor, referring to Humboldt not finding out how these cylinders of hard stone were perforated, says that they "were perforated, not as Humboldt thinks, by high mechanical skill, but merely by the most simple and savage process, with that utter disregard of time that lets the Indian spend a month in making an arrow."⁶

The time here alleged as having been occupied in the making of an arrow compares well with the labor necessary to bore a few inches of

¹Capt. John G. Bourke, *American Anthropologist*, January, 1890, p. 61.

²Karl von den Steinen, "Unter den Naturvölkern Zentral-Brasiliens," Berlin, 1894, p. 204.

³Alfred R. Wallace, "Narrative of Travels on the Amazon and Rio Negro," London, 1853, p. 278.

⁴Edward T. Stevens, "Flint Chips," etc., London, 1870, p. 96; Sir John Lubbock, "Prehistoric Times," New York, 1878, p. 561.

⁵W. M. F. Petrie, "Mechanical Methods of the Ancient Egyptians," *Anthropological Institute of Great Britain*, XIII, p. 108.

⁶Edward B. Tylor, "Researches into the Early History of Mankind," New York, 1878, p. 188.

"imperfectly crystallized quartz of the color of marble." Arrows are made in very many ways in different parts of the world. According to accounts of travelers who have witnessed the operation, they are made by fire, by blows, by pressure, and with the teeth, yet fifteen or twenty minutes would be a liberal allowance of time for an ignorant and clumsy arrowhead maker to complete an implement. It will be observed that Wallace speaks entirely from what he has been told, and says that usually they are only bored through one end, and that the stone is poorly crystallized, and consequently must be softer than quartz proper. He has not, judging from his remarks, even witnessed the work. This remark as to the time required to make one of these cylinders will have to be classed with Lafitau's statement that a lifetime was not always sufficient to complete a stone ax.

The writer has demonstrated that a week would be ample time in which to make an ax of the hardest stone, as it is known that a few minutes is sufficient to make an arrowhead. Even if these tubes were eight inches long, to make a hole the entire length of the cylinder should not require a month, and the average white man, if given a couple of days to familiarize himself with the tool, would decrease the time here allowed by one-half.

The writer regrets his ignorance of a knowledge of the plantain and *Urania*, but can say that it enters the question under discussion to a very limited extent, provided the stem is strong enough to allow of sufficient pressure to cause the sand used with it to scratch.

The writer is informed that the natives of Alaska in working walrus ivory first soak it a week or so in urine, by which means the material is sufficiently softened to facilitate greatly the working of it, and that after it dries, the ivory is uninjured and becomes as hard as it was before.

"The Andamanese and Nicobarese, for boring small holes in wood, use thin, iron-tipped arrows or turtle harpoons."¹

At the commencement of this century the Egyptians were represented as making tubes by revolving a straight drill between the extended hands, the same method that would be employed by a North American Indian.²

Lawson refers to a method of drilling with the straight shaft that at times would be employed, one may naturally suppose, when the cutting was done directly by the drill point without sand. "The Indians," he says, "grind thin shells on stones and other things until they make it current, but the drilling is most difficult to the Englishman, which the Indians manage with a cane or reed. Thus they roll it continually on their thighs with their right hand, holding the bit of shell with their left; so they in time drill a hole quite through it, which is a very

¹ E. H. Mann, *Anthropological Institute of Great Britain*, xi, p. 270.

² "Description de l'Egypte," ii, pl. 27, 2d edition. Published by C. L. F. Pancoucke, Paris.

tedious work, but especially so in making their ronoak, four of which will scarce make one length of wampum."¹ This operation is shown in fig. 98.

One of the most remarkable cases of accommodation to circumstances was related to the writer by Capt. E. P. Herendeen, who passed many years in the Arctic, of an Alaskan Eskimo, who had cracked the barrel of his gun. He sawed off a piece of a discarded gun barrel of larger bore. Finding it was too small to fit over the barrel which he desired to repair, he filed the sawed piece with an old file until it was nearly large enough to slip over the cracked barrel, and then, after he had heated the larger piece until he had given it sufficient expansion, he slipped it on his gun, and the contraction made a jacket of the most scientific character and excellent fit.

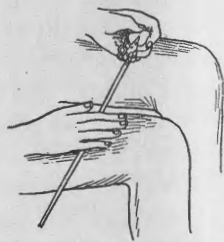


Fig. 98.

HORIZONTAL DRILLING.

As the process of making fire by revolving a shaft resembles perforating with the same implement, so does spinning in a measure resemble drilling, a fact to which Smith calls attention. He says, "Betwixt their hands and thighe their women use to spin the barks of trees, deare sinews, or any kind of grasse they call *pemmenaw*."²

Squier refers to the aboriginal contrivance for spinning, not being yet wholly displaced. "It is," he says, "exceedingly simple, consisting of a thin spindle of wood, 15 or 16 inches in length, which is passed through a fly wheel of hard, heavy wood 6 inches in diameter, resembling a wheel of a pulley, except that it is convex instead of concave on the edge. The spindle thus resembles a gigantic top when it is placed in a calabash or hollowed piece of wood to prevent it from toppling over when not in motion. A thread is attached to it just above the fly, and it is then twirled rapidly between the thumb and forefinger,"³ spinning as shown in fig. 99.

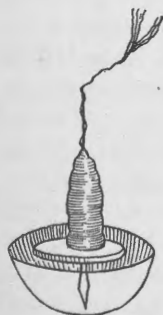


Fig. 99.

NICARAGUAN SPINDLE
IN BOWL.

From a figure by Squier.

The Papagos, a few years since, as possibly they do yet, twirled the same character of spindle in shallow stone mortars, as the writer is informed by Gen. D. H. Rucker, who lived in their country for years.

There are many spindles of this character in the U. S. National Museum from the Pueblo dwellings of the southwest, yet among these Pueblos it was not uncommon to hold the spindle and roll it with the foot.

¹ Lawson, "History of North Carolina," p. 315. Raleigh reprint.

² John Smith's Works, Arber's reprint, p. 69.

³ E. G. Squier, "Nicaragua," New York, 1860, p. 269.

The ancient Mexicans are represented by Kingsborough as standing up and spinning on a shaft held in the air by a hook at its end,¹ and the spinning by the Nicaraguan process is also figured in the same work.

The disks of these Pueblo spinning shafts are usually less than 3 inches in diameter by one-fourth of an inch in thickness, though disks of pottery are not unusual, and even those of stone are met with.

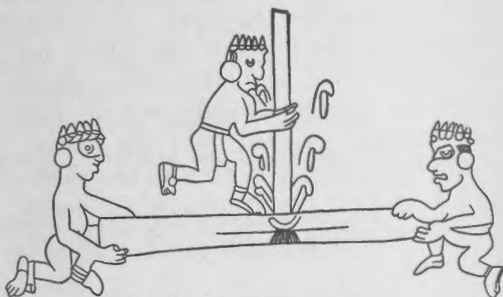


Fig. 100.

MEXICAN DRILLING.

Facsimile of an original hieroglyphic painting preserved in the Bodleian Library at Oxford, England.

Fig. 100 is after Kingsborough, and represents the simplest form of drilling as well as that most widely known, and occurs constantly among the Mexican paintings. The persons manipulating these drills are always represented in typical postures occupied with the work. This is a curious representation of a man apparently revolving a shaft while two assistants steady the log.

The properties of the shaft fire stick were familiar to the East Indian, and are referred to by Dr. Muir in verse referring to the Vedic myth relating to Agni, the Fire god, one of the most prominent deities of the Veddas. He says:

Sprung from the mystic pair, by priestly hands
In wedlock joined, forth flashes Agni bright;
But, oh, ye heavens and earth I tell you right,
The immortal child devours the parent brand.²

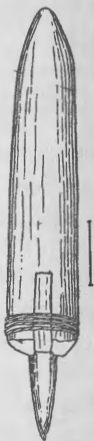


Fig. 101.

DRILL POINT OF ERUPTIVE ROCK, PROBABLY USED IN MAKING SLED RUNNERS.

Bristol Bay, Alaska.
Cat. No. 55941, U. S. N. M.

The shafts of drills are of various kinds, though they are usually made from the soft woods of their respective localities. The weight of the shaft was commonly light, though heavy-wood shafts are sometimes employed; the latter are usually, however, on those drills which revolve with a disk.

In fig. 101 is shown a drill point made of an eruptive rock, the shaft being catalogued as one used in making sled runners. It is from Bristol Bay, Alaska. The shaft is remarkably short and thick for its length, being five inches

¹ Lord Kingsborough, "Mexican Antiquities," II.

² Hindu Mythology, p. 21. W. J. Wilkins, "Vedic and Puranic," Calcutta, 1882.

long with a thickness of seven-eighths of an inch. The blade of this drill was referred to in fig. 76, and has been fitted into a mortised socket in the side of the shaft and has a plate of wood neatly closing the aperture. Then a groove has been cut around the base of the shaft, including the plate, and a fine string made from two twisted threads of hide has been carefully lashed into the groove, making a surface smooth with the shaft. This is one of the shortest drill shafts in the collection of the U. S. National Museum.

The implement shown in fig. 102, from Fort Anderson, made by the Mackenzie River Eskimo in British Columbia, is one of the neatest specimens of drill shafts in the collection. The soft-wood handle, 7 inches long, has a piece of bone neatly spliced to the wood, the splice being held in position by a cord of twisted hide lashed on while wet, which in drying binds so tightly as to make the shaft

as strong as though made of a single

piece. Into the piece of bone the steel point heretofore referred to has been inserted. In fig. 103 is shown a drill shaft and point, both of bone, from Point Barrow, the uses of which it would be difficult to suggest, as the bone point does not appear sufficiently strong to admit of its being used even in perforating any wood harder than pine. From its shape, this tool appears to be intended as a hand drill, although the bone point is shaped, as are the modern metal drill points, with beveled edges. The shaft is six inches long, its end having been bored and the point subsequently driven in without wedging.

The drill shown in fig. 104, also from Point Barrow, has a handle of soft wood, with a stone point (fig. 75) dovetailed into the shaft. In driving the stone point into place the shaft has been slightly split. A groove has then been cut around the end of the shaft, and a twisted sinew string of four strands, perfectly dry, has been loosely and carelessly tied on.

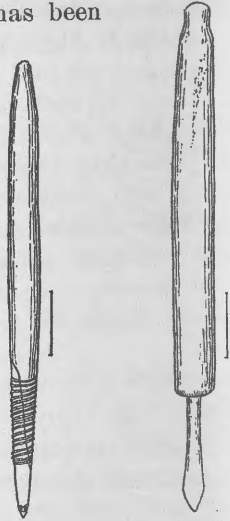


Fig. 102.

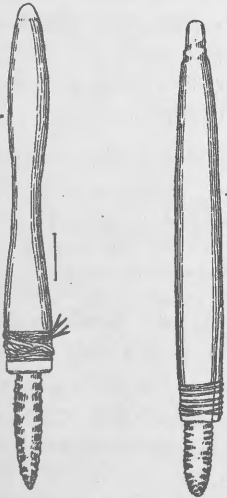
DRILL HAVING WOOD-
EN SHAFT AND
POINT OF STONE.

Fort Anderson.
Cat. No. 7468, U. S. N. M.

Fig. 103.

DRILL HAVING
SHAFT AND POINT
OF BONE.

Point Barrow,
Alaska.
Cat. No. 89619, U. S. N. M.



Figs. 104 and 105.

SHAFT DRILLS WITH STONE POINTS.

Point Barrow, Alaska.

Cat. Nos. 89629 and 89630, U. S. N. M.

In fig. 105 is shown yet another stone-pointed drill from Point Barrow, the point having a greater cross section than the preceding specimen, and is set into a mortised hole cut into the side of the drill shaft. A plate has been fitted into the opening left after the insertion of the point (fig. 101), and the whole end has then been bound with a string made of rawhide.

Fig. 106 represents a plain shaft of perfectly straight wood, 15 inches long. With this shaft and sand any stone may be bored.

In fig. 107 is shown a wooden shaft with nearly round stone point, which has split the shaft in being inserted, and has then been bound with rawhide.

Fig. 108 shows a shaft the upper end of which is of wood made into wedge shape, where it fits into a corresponding saw cut or dovetail in an end, which is of deer horn. Two small holes have been bored through both the antler and wood from side to side, through which bone pins have been driven and smoothed even with the exterior surface. A two-plait sinew cord has been wrapped four times around the shaft, and the end neatly tucked in to hold it from slipping. The point of this shaft is of steel.

Fig. 109 shows an steel-pointed drill from St. Michaels, Alaska, which is used in boring ivory, bone, or stone. This handle is also set into a bone socket, and is held in position by bone pins and a rawhide thong lashed on while wet and allowed to dry.



Fig. 106.

PLAIN WOOD-
EN SHAFT.

Length, 15½
inches.



Fig. 107.

DRILL WITH WOODEN
SHAFT AND STONE
POINT.

Point Barrow, Alaska.

Cat. No. 89628, U. S. N. M.



Fig. 108.

DRILL WITH WOODEN
SHAFT AND STEEL
POINT.

Cape Nome, Alaska.

Cat. No. 44203, U. S. N. M.

All of these shafts are from points along the northern Alaskan coast, and may be said to approach as nearly to the primitive shaft as any that could be found. The drill shafts used in the hands by rolling back and forth vary in diameter from one-half inch to an inch, as this size is more convenient than a smaller shaft would be, and more comfortable to work. The different specimens have been referred to for the purpose of showing what variety of methods there are of accomplishing a similar purpose, and to show how common it was for drill points to be attached in different ways with strings

made of hide of all thicknesses, from the most delicate sinew and babiche to the heavy walrus-hide thong.

Two at least of these shafts appear to be the ends of old harpoons,

which, having been broken, were subsequently made use of as drill shafts. These shafts show by their shape and wear that they have been used for drilling; yet it is impossible to say with any certainty whether they have been used as hand drills, bow drills, or strap drills, though there are indications that at times they would be used in any of the three ways. It is possible that one of these so-called drills, though it has been so used, was really a knife rather than a drill (fig. 104), for its cross section is so thin that it would break, were much pressure put on its edge.

The binding material used on drill points varies greatly, depending on locality and the sources of supply at command. At times the aborigines used plaited sinews; at other times they twisted them; again it would be the thong cut from the hide. Seal skin was a favorite material for binding; walrus skin, both dressed and undressed, was used, and babiche, made from entrails, was widely employed. The Pueblo Indians employed buckskin for binding drill shafts; in other places string was made of bark and of split willow. The savages were extremely ingenious in their adaptation of skins, sinew, and gut for the purposes of making strings and cord.

When skin is soaked in water until it softens, and is then bound over wood or other material and allowed to dry, its strength is very great, and astonishing to one not familiar with its qualities. In repairing shafts or strengthening bows, it was not an unusual thing for the natives to skin off a section of an antelope's leg, and to draw it over the shaft or bow which it was desired to strengthen or reenforce. The skin was put on wet, and when it had thoroughly dried, the binding material fitted with an exactness that made it to all intents and purposes a part of the solid wood.

Fig. 110 shows the upper and lower ends of an unusually heavy shaft from Anderson River, and shows how savages appreciate the reduction of the fatigue of labor. This shaft is evidently intended for very heavy boring. The heavy iron point is set into a hole dovetailed like the one



Fig. 109.

DRILL WITH WOODEN
SHAFT AND STEEL
POINT.

St. Michaels, Nor-
ton Sound, Alaska.

Cat. No. 33172, U. S. N. M.



Fig. 110.

TWO ENDS OF SHAFT.
Anderson River,
Alaska.

Cat. No. 2169, U. S. N. M.



Fig. 111.

MODERN CARPEN-
TER'S DRILL.
Japan.

Cat. No. 131305, U. S. N. M.

seen in fig. 101. To relieve the drag on the headpiece, a bone point is lashed on the upper end of the shaft, which would cause the drill to run much more freely. It will be seen here, also, that the thongs were cut to suit the work required of them.

Fig. 111 shows a steel-pointed wooden shaft drill, such as is used by the Japanese carpenters of the present day. The shaft is of a light wood, about 8 inches long; its point is carefully protected by a sheath of bamboo, presumably intended to prevent its rusting.

Fig. 112 also shows a hand drill with a wooden shaft, but from Point Barrow. This shaft is 13 inches long and has an iron point, the point being covered with a bone sheath, the sheath being held in position by a thong of seal hide seized on. The sheaths of these drills are very similar, one to the other. What causes this similarity? Is it Professor Mason's line of migration worked out with Japanese and American similarity, or is it not rather that similar conditions bring about similar results, and that both of these point covers are independent efforts to prevent the rusting of a metal drill point?

The points of drills vary as much in length as do the shafts, for while the point of a Zuñi or Moki pump drill does not often extend over one-fourth of an inch beyond the shaft, the Eskimo jasper points are at times as much as 5 inches or more long, and those of copper are even longer.



Fig. 113.

CIRCULAR DRILL
POINT SECURED
TO SHAFT WITH
BITUMEN.

California.

Fig. 113 is given merely to show the manner of attaching a drill point, such as is represented in fig. 78, to its shaft, in which it is socketed and held in position by means of bitumen. This holds the point with sufficient force for it to remain in position, for only enough was required in using such a point to make it bite the stone it is drilling, as in the California stone balls represented in fig. 26.

In the Mendoza codex of Lord Kingsborough's great work on Mexican antiquities there are two illustrations, as here represented, one above the other, as in figs. 114 and 115. These objects appear so similar in some of their characteristics to the drill that they are offered for what they are worth. These figures are upon the same plate with five rows of beads, which have been bored, or neck-

laces of turquoise, and may have a significance, yet there is no evidence of such a drill being used anywhere, though the one shown in fig. 114 is not dissimilar to a drill which is shown in fig. 143 and which has been successfully worked. Fig. 115 is apparently a frame and in some way connected with spinning, though it also may

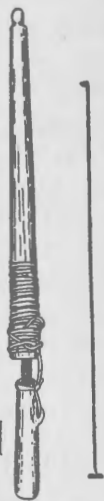


Fig. 112.

SHAFT DRILL WITH
IRON POINT AND
SHEATH.

Point Barrow,
Alaska.

Cat. No. 96768, U. S. N. M.

be used, if there were a disk placed upon the shaft, as a most successful drill frame.¹

The Mexican codices, as illustrated by Kingsborough, have numerous representations of the drill, one of which (fig. 116), although crude in drawing, forcibly illustrates the manner in which the Mexican held his drill between the palms of the extended hands, which are pressed against the drill shaft and alternately moved to and from the workman. The illustration is apparently intended to represent the boring of wood, but many of the others in Kingsborough's work show that they are fire drills. If this figure is compared with fig. 100 it will be seen that the shaft drill was probably used by the Mexicans for general purposes, as it appears to have been by most nations of the world and as it is still employed by the Japanese, in preference to the tools of western nations.

Fig. 117 shows a method of perforating by means of a straw or bristle, or a slight shaft, only suitable in boring diminutive holes, such as are at times found in small pieces of carnelian or fire opal which have been discovered in Arabia Petraea. Such a perforation in a stone in the writer's possession is so small that the point by which the hole was drilled could not be larger than an ordinary hog bristle. The implement, whatever it was, was probably held, as shown in

the illustration, between the thumb and index and middle fingers, and moved alternately back and forth as the point is pressed upon the object, and would make 100 or 150 revolutions per minute. Such a point used with fine emery powder would perforate a hole with rapidity.

The straight shaft revolved, as shown in fig. 116, by the Mexicans or, as in fig. 51, by the Bushmen, cuts wood rapidly. The workman would select the drill in accordance with the material it was intended to perforate, he being governed by

the supply and by the requirements of the case. Except in boring wood or very soft stone, sand would likely be employed as the cutting material.

The point of the drill shaft being pressed upon the object it is intended to bore, and sand being used in connection with the point,



Figs. 114 and 115.
MEXICAN ILLUSTRATIONS.
From figures by Kingsborough.

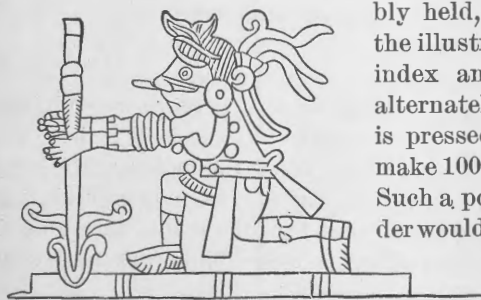


Fig. 116.

MEXICAN DRILLING.

From a figure by Kingsborough.

Facsimile of an original Mexican painting presented to the University of Oxford by Archbishop Sand.

¹Lord Kingsborough, "Antiquities of Mexico," I, pl. 39.

the sand is moved on the bottom of the hole and on its sides, cutting as the drill revolves. This process being continued will bore the hardest mineral with dispatch.

What is here said regarding drill points, the attachments of the points to the shafts, the use of sand, and the cutting of material, applies equally to all primitive drills. The process is the same, all improvements up to the time of steel being in increased velocity and the facility with which the tool could be manipulated.

The rapidity with which the cutting is done depends upon the quality of the sand, which varies greatly, and the hardness of the material to be cut. The constant revolution of the shaft crushes the sand until it is ground to a powder; the heavier particles come under the pressure and thus continue the abrasion and consequent deepening of the hole. The texture of the shaft, where a wooden point is used, appears to have a greater influence upon the cutting than one would suppose. If the shaft be too hard, as has already been said, it has a tendency to roll the sand; if too soft, the shaft cuts as the sand holds to the stone. Ash wood answers as well as any other, though there is no hard and fast rule that one can apply generally, ash being neither one of the hardest nor softest of woods. Experience soon teaches that which is best under the circumstances of each case. Experiments have not been carried to a point where it would be safe to make a more positive assertion. Of four woods used for drilling—ash, hickory, oak, and red wood—ash answered best. The revolutions of the shaft drill would approximate 160 per minute. The shaft drill worked in a horizontal position turns rather more rapidly, say 180 times per minute, than does the shaft held perpendicularly. The shaft drill worked upon the knee can be kept longer in motion than the perpendicular shaft can, as one may easily see who will revolve a lead pencil upon the knee, holding its point against any object. Bourke says: "With an ordinary arrow held between the hands and vertically revolved, the Apaches bored holes in beads. A bead of chalchuitl was made in my presence, under very disadvantageous circumstances, in a trifle less than twenty-six minutes."¹

Maj. J. W. Powell informs me that he has seen the Indians in Utah work the drill by rolling it upon the leg and holding the stone to be drilled in the left hand.

The bases of drill points are usually made with flattened and broad ends, as they were more easily bound to the shaft when in this shape, yet by mortising or boring even a circular drill point could be and was utilized.

The position occupied in working the vertical drill shaft was neces-



Fig. 117.
DRILLING WITH BRISTLE.

¹ John G. Bourke, *American Anthropologist*, January, 1890, p. 61.

sarily a strained one, and consequently could not be very long continued without rest.

To press a flexible stick by holding it near the head with the left hand and with the right hand to grasp the stick by the middle and turn it round and round while the left hand holds the end to the breast in one place, on the principle of the brace and bit, makes quite an effective implement at times.



Fig. 118.

EGYPTIAN BREAST DRILL.

From a figure by Wilkinson.

Such an apparatus appears to be quite ancient, the illustration (fig. 118) being taken from an old Egyptian painting, representing a workman boring holes in the bottom of a mummy case, at the point at which holes are commonly found, into which pins of wood are fitted. The inference becomes natural that the work was practically done with a brace and bit. The workman is seen in a typical position to bring pressure on the drill, while with his right hand he turns the shaft; and to make the work more distinct and typical, we see the breast piece, which probably contains a socket for the shaft.¹

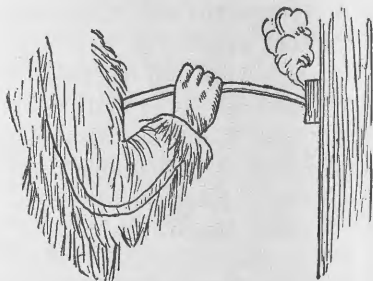


Fig. 119.

FIRE DRILL.

Brazil.

From a figure by Tylor.

It is to be regretted that the illustration is not

more distinct, yet the undoubted familiarity of the Egyptians with primitive drills leaves little room to doubt the character of work which is intended to be illustrated.

Tylor says that the principle of the common carpenter's brace with which he works his centre-bit is applied to fire-making by a very simple device, represented in fig. 119, which, he states, is drawn according to Darwin's description of the plan used by the Gauchos of the Pampas. Taking an elastic stick about 18 inches long, one end is pressed on the breast and the other, which is pointed, is placed in a hole in a piece of wood, and then rapidly the curved part is turned like a carpenter's centre-bit.²

To adapt the principle of this brace for drilling purposes it is necessary, to make it effective, that the point should be of some hard substance and that the body of the shaft should be bound to a point, on the principle shown in fig. 120. The implement, if pointed with a bone,



Fig. 120.

BREAST DRILL.

¹ Sir J. G. Wilkinson, "Life in Ancient Egypt," III, p. 474.

² Edward B. Tylor, "Researches into the Early History of Mankind," New York, 1878, p. 241.

might answer as a drill for boring soft wood, but it may be doubted whether such tool was equal to the shaft drill.

The Rev. Arthur Rigg refers to this mode of drilling in the hill country in the western part of central South America, and speaks of the man pressing one end of the shaft upon a plate on his breast, and very pertinently asks whether this suggested the carpenter's brace or whether the brace suggested this.¹ This style is improved upon in Finland, as in fig. 121, which represents a breast auger; the 15 inch shaft has a diameter of three inches and an iron point 10 inches long. Through the middle of the wooden drill shaft a hole has been mortised holding a handle of a diameter slightly over one inch. This handle has been tightly wedged into position. In the head of the shaft a round pin of iron has been driven through an oblong block and into the shaft. The hole in this head block is purposely left large enough to allow the shaft to be revolved freely as the block is pressed against the breast and the cross handle turned. The block answers for a breast shield, and the tool is quite an effective auger, though the speci-

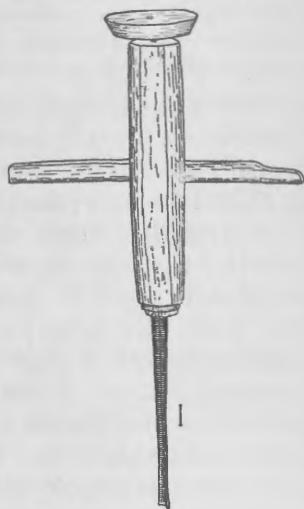


Fig. 121.

BREAST AUGER.

Finland.

Cat. No. 121785, U. S. N. M.

men is extremely primitive. As the cross-piece increased the force with which work could be done with the awl, so here again we see the cross handle increase equally the force which may be brought to bear upon the shaft or primitive breast drill.

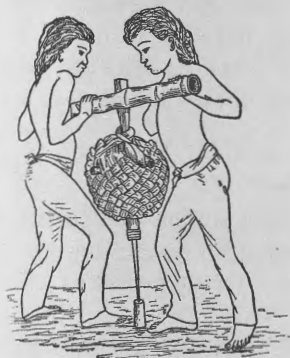


Fig. 122.

MALAY AUGER.

Island of Sambock, near Java.

From a figure by Rigg.

The Rev. Arthur Rigg says that Wallace, in his account of the Malay Archipelago, describes a plan of drilling which he found in operation at Sambock, an island on the west of Java. (Fig. 122.) Mr. Wallace said one of the natives showed him the guns made by native workmen. The barrels were twisted, well finished, and almost six feet long. Mr. Wallace asked how the guns were bored. He was told "with a

basket of stones," and taken to see one.

Through a bamboo basket was stuck a pole about 3 feet long; the bottom of the pole has an iron ring and a hole in which four-cornered borers of hardened iron can be fitted.

¹ Cf. Arthur Rigg, "Tools Used in Handicraft," Journ. Soc. Arts, London, August 6, 1875, p. 805.

The barrel to be bored is buried upright in the ground. The shaft is held by a cross piece of bamboo with a hole in it, and the basket is filled with stones to get the required weight. Two boys turn the bamboo. The barrels are made in pieces about 13 inches long, and are first bored small and then welded together upon a straight iron rod. The hole is afterwards worked by borers of increasing size, and in three days the boring is finished. The tools from first to last were hardly sufficient for an English blacksmith to make a horseshoe.¹

It will be admitted the above is a very crude method of boring gun barrels, yet the time occupied in completing a barrel six feet in length—about three days—shows well what can be accomplished in a short time with primitive tools.

A primitive auger, worked horizontally yet very efficiently, has been described by a friend as having been seen years ago in a blacksmith shop in the far west. He tells me it worked quite satisfactorily. A large wagon wheel was selected, the hole in the hub being closed after inserting therein a long bit of iron, which was wedged in. Two box bearings were fixed on a table holding the shaft, in which the bit was inserted; the object to be bored was then pressed against the end of the bit. The wheel was swung around by its spokes, and thus the bit cut the object held against it.

Fig. 123, from Lord Kingsborough's works, is a most singular caricature of the work with the auger. It is difficult to decide whether the creature in the drawing is intended for man or beast. The position of working the auger is typically represented. The posture of this figure suggests foreign influences differing from primitive Mexican culture.

THE STRAP DRILL.

The strap drill has been referred to by several authors, yet their allusions to it have usually been as an implement for producing fire by friction. Such use, however, is only secondary, for its primary purpose was evidently that of a perforator.

This tool consists of three parts—the shaft which revolves, the headpiece which holds the shaft in position, and the strap by which the shaft is worked. To work this implement, the point of the shaft is placed upon the object to be perforated; the headpiece is then placed on the shaft and is held in place by the teeth of the person intending to work it. At this point an ordinary thong is wrapped once around the shaft, and, one end being held in each hand, the thong is pulled alternately to the right and to the left, the thong being all the while

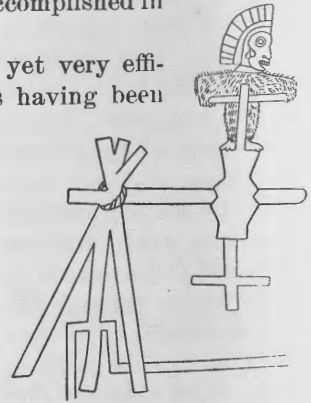


Fig. 123.

CARICATURE.

From a Mexican painting, reproduced by Kingsborough.

¹ Arthur Rigg, "Tools used in Handicraft," Journ. Soc. Arts, London, August 6, 1875, p. 805, fig. 14.

held taut, as represented in fig. 124. This drill has been used by the Greenlanders for the last three hundred years, according to Tylor, who says that Davis, after whom Davis Straits are named, referred to it in 1586, and that they "began to kindle fire in this manner: He took a piece of board wherein was a hole half thorow; into that he puts the end of a round stick like unto a bed staffe, wetting the end thereof in Trane and in fashion of a turner with a piece of leather by his violent motion doth very speedily produce fire."¹

Sir Edward Belcher, in an account of his trip to the north of Icy Cape, describes the use of the strap drill.²

The headpiece of a strap drill was somewhat more complex than was that of the bow drill. While the headpiece of the bow drill was ordinarily held in one hand, leaving the other hand free to work the bow, the strap drill required both hands to pull the strap to and fro, and as a consequence other arrangements had to be made for holding the shaft steady in an upright position. The only practical method of accomplishing this was adopted, which was to hold the headpiece in the mouth. The same means were, however, at times employed when the bow-drill head was held in the teeth. These headpieces generally appear to have been preserved with great care, judging from the manner in which the one shown in fig. 125, from Kotzebue Sound, has been repaired.

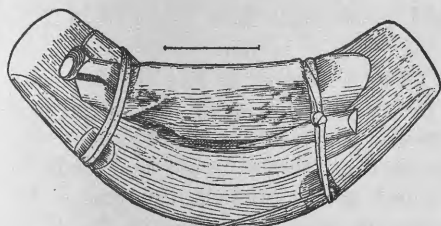


Fig. 125.

HEAD-PIECE OF STRAP OR BOW DRILL.

Kotzebue Sound, Alaska.

Cat. No 48585, U. S. N. M.

Owing to long use, that part of the headpiece which was usually held by the teeth, and which we call the grip, had either worn in two or in some way had been broken out and had to be replaced, if the implement was again to be serviceable. A new grip was cut out to fit in the place of the old one which had been destroyed, notches being made in the ends of the grip, as seen in the figure, and in the sides of the headpiece, and the grip was then bound to the curved part of the headpiece by means of a flat hide thong, which was wrapped on while wet and allowed to shrink in drying, as is usual with all lashings among the natives of northern Alaska.



Fig. 124.

ESKIMO STRAP DRILL.

Alaska.

¹ Edward B. Tylor, "Early History of Mankind," New York, 1878, p. 242, fig. 24.

² "Works of Art by the Esquimaux," Trans. Ethnol. Soc. Lond. 1825-1829, p. 139.

Binding material of this character was used by most of the natives of this country. In the instance above noted unusual solidity was required, owing to the jar of this part of the headpiece while the drill was in motion, and, as a consequence, we find the native workman took all the precautions which the case admitted of, and it is submitted that a better piece of work could scarcely be done. Two small wooden wedges, as seen in the figure, were made, and each wedge was driven under the binding of hide while it was yet wet. One of the wedges

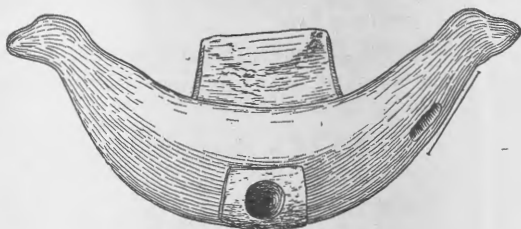


Fig. 126.

HEAD-PIECE WITH SOCKET.

Alaska.

Cat. No. 48170, U. S. N. M.

was driven in on each end of the grip, on opposite sides, so that when the thong dried, it may truthfully be said that the grip was as firmly attached to the rest of the headpiece as it could have been before it was broken out. This grip is worn almost in two again, and shows very distinctly the print of the teeth upon it. Such a specimen would hardly be encountered in a locality where abundant supplies of wood were found, but on the shores of the Arctic Ocean, where driftwood alone is obtainable, even small pieces of it are most highly prized. Should the shaft of a drill slip out while a workman was holding the headpiece between his teeth and revolving the drill rapidly, there is the possibility of an ugly wound being given to the one manipulating the drill. To prevent this, the shaft holes are usually deeper in those headpieces which are intended to be held by the teeth than they are in those intended to be held by the hand.

The necessity of holding the headpieces of the strap drill firmly between the teeth, rendered it essential that they should be made of wood, as is almost invariably the case in the specimens in the U. S. National Museum. The only excep-



Fig. 127.

CONCRETE SOCKET
STONE.

Alaska.

Cat. No. 33150, U. S. N. M.



Fig. 128.

CROSSSECTION OF CON-
CRETION SOCKET
STONE.

Alaska.

tions observed are two small headpieces of walrus ivory from Cape Nome, Alaska. The rapidity with which the drill shaft wore the headpieces, if they were made entirely of wood, caused the natives to mortise a block of stone into them on the lower side, which comes in contact with the head of the shaft, as was also done with the headpieces of the bow drill, as seen in fig. 126. These blocks which were mortised into the headpieces were not, however, invariably of stone, for specimens with metal sockets are by no means unusual and are quite modern.

These metal sockets were ground, usually, into square plates, thereby making it much more easy to fit them into the wood than could be done with irregularly shaped stones. In several instances circular concretions from Cape Nome, Alaska, are found, which have been utilized as socket stones, one example of which is here presented in fig. 127, a cross section being shown in fig. 128.

The forms of these headpieces vary according to the taste of each owner, the grip alone being essential. Beyond that there is no hard and fast line governing their shape. Some were cubes, others again were wedge-shaped, the blade of the wedge being the part which was gripped between the teeth. The crescent is a very common shape among headpieces, the grip being in the center of the concavity of the crescent. These headpieces vary from six inches in their greatest length to less than two inches; from top to bottom they are from one to three inches, or more; in width they are from one-fourth of an inch (in the grip) to $1\frac{1}{2}$ inches on the lower side, next the shaft.

The natives in selecting stones for sockets not only chose striking colors, where they could obtain them, but sought graceful forms as well. This appreciation of form and color is almost invariably indicated in stone implements of all sorts and of all ages—the color and shape of a stone influencing its selection at times to the detriment of the implement it was intended to make.

In setting the sockets, where they are square or diamond shaped, as in fig. 129, either those of stone or of metal, it will be noticed that they are carefully mortised into the wood, with due regard to graceful lines, and are scarcely ever placed haphazard; yet in one instance even this rule is violated and the socket is set in one side of the headpiece and not in the center of it.

The ends of these headpieces present every variety of shape, some being perfectly plain, without the slightest effort at ornamentation, while at other times it will be seen that holes have been bored through one or both ends. These holes were intended to be utilized for running the straps through with which the drill was worked, to prevent their loss in the snow. At times the holes are cut through the headpiece from its upper to its lower side (see fig. 126); at other times they are perforated from side to side. There may be the head of a whale rudely carved on one end of a headpiece, or on both ends; or again there will be carved the heads of seals, as in fig. 126. In one instance there is a human face on one end and the head of a bear on the other. There is a specimen from Diomed Island, of pronounced crescent shape, having a socket of petrified wood, which has been carefully ground into shape. On one side of this socket three blue glass beads have been set into the wood in a straight row, from the socket toward the end, while on the other end only two beads were set in the wood. It was apparently



Fig. 129.

SOCKET STONE FOR HEAD-PIECE.

Alaska.

Cat. No. 48703, U. S. N. M.

intended to insert a third bead, but the hole which was made to receive it was apparently too large; therefore a plug was inserted where the third bead should have been set, and the plug was then smoothed off even with the surrounding surface. One specimen has a bird's head carved on each end; another has an animal's head, with open mouth, carved on one end. Another specimen has bears' heads on each end, with eyes designated by small blue glass beads carefully set in the wood. While these headpieces have the grip usually in the hollow of the crescent, there are specimens, on the other hand, where it is on the back of the crescent and the socket stone is in the hollow. At times these socket stones are made of pebbles of fossil ivory, as in fig. 130. A specimen from Cape



Fig. 130.

SOCKET OF FOSSIL IVORY.

St. Lawrence Island, Alaska.

Cat. No. 63358, U. S. N. M.

Darby appears unique, and possesses a curious history. The socket stone is a good one and the shaft hole is sufficiently deep to hold the shaft in position, yet the owner appears to have been so careless as to allow the shaft to slip on one side of the socket, until there are worn two distinct holes, one on each side. In addition to this the end of the specimen has been split and an iron blade inserted. This blade extends less than one-sixteenth of an inch beyond the wood and the end is fastened again by a flat thong of seal hide, which, if not closely examined, would be mistaken for a willow string. It is tightly bound to, and neatly wrapped around, the wood. This presents a curious example of the influences upon savage life of civilized surroundings, for in the one implement we see the ages of stone and of iron combined.

On the ends of the thongs of strap drills are almost always hand pieces, which greatly facilitate the pulling of the thongs. They were usually of ivory, but at times of wood. The teeth of a bear were favorite objects for this use, one of which is here shown (fig. 131). It is a tooth with a perforation through its center; through this the thong was drawn, and in cases where a handle was not used a knot was tied in the ends. These teeth fitted the hand comfortably without having their shape changed by grinding, as was necessary with walrus ivory or bone or wood. Handpieces of drill thongs vary greatly in shape and often can not be distinguished from the strap handles which are employed in drawing sleds. A specimen very similar to certain of

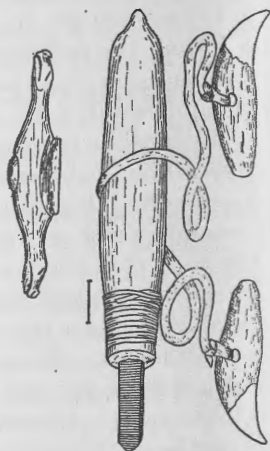


Fig. 131.

PARTS OF STRAP DRILL.

Alaska.

Cat. Nos. 33174, 33651 and 55946, U. S. N. M.

employed in drawing sleds. A specimen very similar to certain of

those in the U. S. National Museum, which are chiefly from Alaska, was found in the bone caves of Ojcow, Poland.¹

A somewhat similar class of implements is described from the caves of Baoussé Roussé, being "objects of bone having somewhat the form of stubby spindles round on both ends and showing on the middle a pronounced circular depression."²

Drill straps are made from strips of walrus hide—that unfailling cord supply of the Alaskan Eskimo; yet upon occasion the natives use other skin cut in suitable strips.

Fig. 131 shows the parts of a strap drill ready to be put to work, and here we see the headpiece straight and round, with the ends decorated with animals' heads carved out of the wood of which the object is made.

In using the strap drill, a much greater power is developed than with any implement which has so far been described; it is extensively employed by the Eskimo, was known to the Greeks, and probably to the Egyptians, from a very early period.

To a person first using this drill, the jar is almost unbearable to the brain and the teeth. Though the disagreeable sensation becomes less each day the drill is worked, one can scarcely imagine its use to have become agreeable. The drill is worked as represented in fig. 124. The toggles on the thongs are, if not bored, carefully grooved, with the thong tied neatly on. Sometimes these toggles are prettily and neatly carved. The speed of this drill may be given at about two hundred revolutions per minute. The only pressure needed is that given as the headpiece is pressed down and gripped by the teeth.

Some practice is necessary to work this drill easily, for if the headpiece is too firmly pressed, the strap will slip on the shaft; or if not pressed with sufficient force, the shaft pulls out from the socket and consequently stops work.

The natives of Point Barrow use this drill at present, and, I am informed, prefer to do their heavier work with it or with the two-handed bow drill, in which the headpiece is held as is the headpiece of the strap drill.

The drill shafts are commonly pointed with stone, bone, or iron, the shaft usually being of soft wood. The strap handles are at times made of bears' teeth which have been sawed lengthwise, thereby making two handles of one tooth, so tied on that the flat part of the tooth where it has been sawed comes against the palm of the hand.

It is to be regretted that so little data exists from which to predicate an opinion on the question as to whether the strap drill has been introduced from Asia or from Europe, or whether it owes its presence in America to independent discovery.

There is much yet to learn concerning the distribution of implements,

¹ "The Bone Caves of Ojcow." Translated by John Edward Lee.

² D'Acy, "L'Âge des Sépultures des Grottes de Baoussé Roussé," p. 24.

but what is known appears to indicate that the North American Indian possessed no other drill than the shaft revolved by the hands, prior to the advent of the whites. None of the early writers describe, so far as I am aware, any other drill in America than the straight shaft.

A very general method among primitive people was to use the feet to aid the hands when working with tools, as may be seen in certain eastern turning lathes; as referred to in South America on the Amazon for

holding objects being bored, or as seen in an ancient Egyptian glyph, where a leather worker holds the strip of leather with his toes while cutting the strips.

The headpiece of the strap drill could be held by one person, as represented in fig. 132, and, if necessary, two persons, or even more, could pull on each end of the strap.

Fig. 133 is of a fire drill of the island of Nias, south of Siam. Modigliani, from whose work the illustration



Fig. 132.

GREENLANDER MAKING FIRE.

From a figure by Tylor.

is taken, refers to its use by these people, and speaks of the headpiece consisting of "a bamboo stick, in the middle of which there is a little hole into which the shaft enters. One person," he says, "holds the bamboo firmly, another sits opposite on the ground with his feet firmly pressed against the base block. The shaft is set in motion by a cord of vegetable fiber twisted several times around it, and which is drawn back and forth."¹

A curious variation of the employment of the strap is the reference to its use in Borneo, where a strap of reed is said to be passed under a dry log, upon which a native stands, with the ends of the strap in his hands, and rapidly pulls it back and forth until the spark appears.

The principle of the strap drill is thoroughly familiar to the Brahmans of India. An example is shown in fig. 134. The straight, grooved shaft of this drill has been turned in a lathe, as also the handle into which a metal socket has been let, on the order of the stone sockets of the strap drills of northern Alaska. One person is said to press on the headpiece while two others hold, each one end of the strap or cord, as is done in India, and by a backward and forward motion the shaft revolves.

A shaft similar in all essential features to the last figure is represented in fig. 135, and is from Ceylon. The shaft of this drill, like the preced-

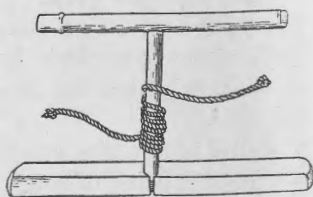


Fig. 133.

STRAP DRILL.

Island of Nias, south of Siam.

From a figure by Modigliani.

¹ Elio Modigliani, "Un Viaggio a Nias," Milan, 1890, p. 385.

ing one, has been turned in a lathe. There is in the head of this shaft an iron pin, polished by its wear on the headpiece. Unfortunately, the remainder of this implement is not in the Museum collection, so it can not be positively said that this is a drill shaft. Judging from its appearance, however, there can be but little doubt of it.

The implement shown in fig. 136 is entered in the catalogue of the Abbott collection of the New York Historical Society as "a round piece of wood from the pyramid of Sakkarah." This shaft from Egypt is so similar to the Ceylonese implement, as well as to the shaft of the fire apparatus of India, as to convince one that it is intended for the same implement as the two preceding objects herein shown,

and consequently that it is the shaft of an Egyptian drill. This shaft is not turned, as are the two preceding ones, nor are there circular grooves on the shaft. The grooves of this shaft appear to be cut as though with a knife. The upper end is rubbed smooth as if with use, yet the lower end has no receptacle for its point, unless it fitted on the outside.

Fig. 137 shows a modern Indian butter churn, and the manner in which it is worked. The pronged shaft is turned by means of a cord, in identically the same manner as that by which the Brahmins produced their sacred fire, and is taken from an illustration by J. Romilly Allen.¹

Looking at this object, we can well see it would make a most excellent churn. The pins tied on the tree hold the straight churn shaft upright, the prongs of which are in the cream in a jar below. Wrapping the strap or cord around the shaft, the cord was pulled alternately back and forth, just as the cord is pulled on an Alaskan strap drill. With this churn and the fire drill before us, there appears little doubt that the mechanical principle of this implement was thoroughly understood, and that those shown in figs. 134, 135, and 136 are all of them entitled to be regarded as pieces of drills, for if one change the wooden bit shown in fig. 134 and replace it with a metal point, we have the perfect strap drill.

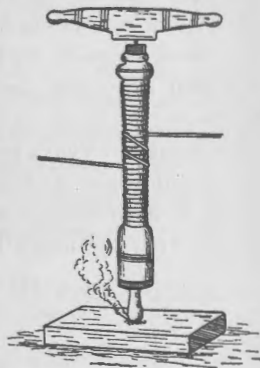


Fig. 134.

SACRED FIRE DRILL.

India.

Cat. No. 150887, U. S. N. M.



Fig. 135.

STRAP DRILL.

Ceylon.

Cat. No. 168710, U. S. N. M.

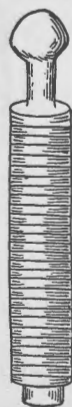


Fig. 136.

ANCIENT EGYPTIAN
SHAFT.

Abbott collection, New
York Historical Society.

¹ "Notes on fire-producing machines," Proc. Soc. Antiquaries of Scotland, p. 236.

That the strap drill is very ancient can not be doubted for an instant, for Homer clearly refers to it in the verse where Ulysses describes himself and companions, imprisoned in the cave by Polyphemus, king of the Cyclops, boring out the eye of the king by means of a strap drill. There has been some doubt expressed by Greek scholars whether Homer intended to refer to the drill as of the time of which he wrote, or of his own time, yet there is little doubt that the principle of this drill is one of the most familiar of all Egyptian pictoglyphs as far back as two thousand years prior to the Trojan war, so that it makes probably little difference which translation be taken, and I give one made by Prof. A. J. Huntington, of the Columbian University, of Washington, D. C., from the ninth book of the Odyssey, where Ulysses says:

I thrust the stake into some embers until it became hot, and with my words I cheered all my companions lest any of them, struck with fear, might retreat. But

when the olive-wood stake became yellow, was about to blaze in the fire, and was in a fierce glow, I took it from the fire and brought it near, and my companions stood around, and a deity inspired them with great courage. Some of them, taking the olive stake, sharp at the end, thrust it into his eye, and I, raising myself up, turned it round and round, as when a man bores ship timber with an auger, and others below him kept the auger in motion with a strap, laying hold of it one on each side, and it moves continually around. Thus did we, having seized the fire-pointed stake, turn it in his eye, made warm and the blood flowed and the entire eyelids and the eyebrows the scorching heat singed, as the pupil burned.

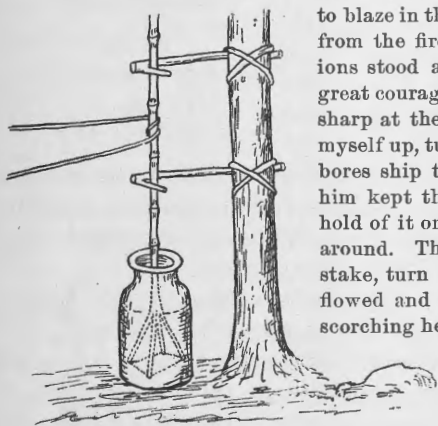


Fig. 137.

HINDU CHURN.

From a figure by Allen.

The New Zealanders are represented—according to F. R. Chapman, in his very admirable paper on the working of greenstone or nephrite by the Maoris—as having used a drill, such as

is shown in fig. 138. This drill is described in the paper referred to by several correspondents, no two of whom agree. The author, however, describes a drill having all the features of the strap drill, and which may very properly be entered here. He says:

The most difficult part of the *méré* (a stone club) is to drill the hole for the thong in the handle. For this, pieces of sharp flint are obtained from the Pahutani cliffs, 40 miles to the north, and are set in the end of a split stick, being lashed in very neatly. The stick is about 15 or 18 inches long, and is to become the spindle of a large teetotum drill. For the circular plate of this instrument the hardened vertebral cartilage of a whale is taken. A hole is made through and the stick firmly and accurately fixed in it. Two strings are then attached to the upper end of the stick, and by pulling them a rapid rotary motion is given to the drill. When an indentation is made in the *pomanu*, the work is easy. As each flint becomes blunted it is replaced by another in the stick until the work is done.¹

¹Trans. New Zealand Inst., xxiv, p. 499.

In referring to the correspondence in the text, this drill is spoken of as the Pirori or Maori drill, after Shortland. Dr. Shortland, however, differs in two essentials. He says the apparatus "was a sharp-pointed stick of soft wood and sand."

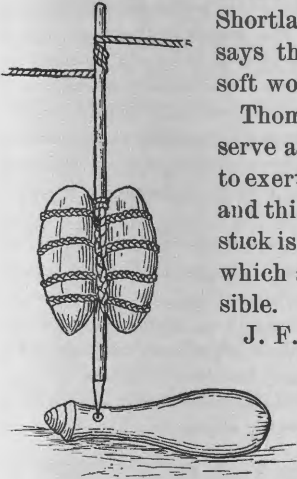


Fig. 138.
NEW ZEALAND DRILL.
From a figure by Chapman.

Thompson, however, attaches the stones which serve as fly wheels to the center of the shaft, so as to exert pressure and perform the office of fly wheels,¹ and this author also says the requisite motion to the stick is given by the alternate pulling of two strings, which appears to the writer difficult, if not impossible.

J. F. H. Wohler, in writing Mr. Chapman, speaks merely of a small fly wheel near the center of the shaft, and although he refers to a skillful balancing of the shaft, he also refers to the alternate pulling of the thong, in which he must be mistaken. Mr. John White, the author of the ancient history of the Maoris, describes this drill minutely,

and is the only one who appears to describe a headpiece to steady the drill shaft, as he says "the upper end of this wood being placed in a block of timber, placed in position to receive it." Nor is this writer clear as to the manner in which the two straps were employed.

The implement shown in fig. 139 while not a drill, yet, as it works under the same law by which the bow drill does, may properly be referred to in this work. It is a gem polisher from Ceylon, the wooden shaft of

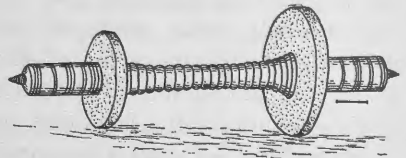


Fig. 139.
GEM POLISHER.
Ceylon.
Cat. No. 168747, U. S. N. M.

which is turned in a lathe and has a shoulder cut on the shaft near each end, upon which are fitted circular disks composed of a combination of corundum and some cement. One of these disks is somewhat larger than the other. At the points of this shaft iron pins are let in to act as centers for the shaft to work upon, and could be operated either by a bow or strap.



Fig. 140.
HINDU LATHE.
From a figure by Holtzapfel.

The Indian lathe (fig. 140) still remains the primitive apparatus which is considered as the starting point of turning.

¹Thompson, "New Zealand," I, London, 1859, p. 203.

The practice there is that when any portion of the household furniture needs remaking, the wood turner is sent for. He comes with all his outfit and establishes himself for the occasion at the very door of his employer. He commences by digging two holes in the ground at a distance suitable for the length of the work, and in these he fixes two short wooden posts, securing these as well as he can by ramming the earth and driving in wedges and stones around them. The centers, scarcely more than round nails or spikes, are driven through the posts about 8 inches from the ground and a wooden rod for the support of the tools is either nailed to the posts or

tied to them by a piece of coir or coconut rope. The boy who gives motion to the work sits or kneels on the other side of it, holding the ends of the rope wrapped around the shaft, his hands pulling them alternately, the cutting being restricted to one-half the motion—that of the work toward the tool. The turning tools of the Indian are almost confined to the chisel and gouge, and their handles are long enough to suit their distant position while he guides their cutting edges with his toes.¹

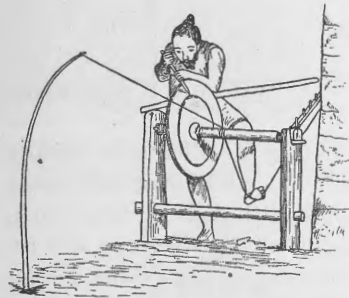


Fig. 141.

KABYLE TURNER.

From a figure in "La Tour du Monde."

Fig. 141 shows a Kabyle turner at work. Unfortunately there is no reference in the text of the book in which the figure appears to the work being done. Yet there is no chance to

misinterpret the principle, and here we may say we first find the use of stored power being employed for human assistance in the reciprocal motion given by the spring of the sapling. The strap being made fast at one end, at the opposite end it is attached to a flexible branch stuck in the ground, having been first carried around a shaft. At the proper distance from the shaft a loop or stirrup is fixed. By alternately pressing the foot and relieving the pressure, whereby the sapling winds the shaft back, a perfect reciprocal motion is established. Similar motion may be, and is, attained by attaching the string to a strong bow above the shaft, to the string of which, made as rigid as convenient, the turning cord is fastened. Being carried around the shaft it is tied to a pedal, the lower end of which is attached to the floor by a strap. Pressing the pedal causes the bowstring to give, and relieving the pressure raises the pedal, the tool cutting only as the foot is pressed, the return being free.²



Fig. 142.

CHINESE TURNER.

From a figure by Holtzapfel.

Fig. 142 is an illustration of a Chinese lathe from Holtzapfel's excellent work on turning, in which the principle of the strap drill is applied to horizontal motion in a most satisfactory manner.

The whole implement is of wood, and the motion is given entirely by

¹Holtzapfel, "Turning and Mechanical Manipulations," London, 1879, IV, p. 6, fig. 5.

²"Teur du Monde," XVI, 1867, p. 304.

the feet, leaving both hands free to hold tools and generally manage the work. The workman is said to represent the maker of pipestems turning a bamboo fixed in the central hole of a spindle or mandrel, supported in wooden collars, mounted on top of the bench at which he is seated. Longer and larger works project to a greater extent beyond the collars, and the workman then places himself at the side instead of the end. To turn the more central portions, the cord is shifted from place to place as the work progresses.¹

Florence O. Driscoll, in a recent interesting article in the *Century Magazine*, speaking of the Chinese lathes and jade working, says:

I saw no rotary lathes in Canton. They may be used, but certainly are uncommon. The jade is cut by tools, worked with a reciprocating motion driven by a rocking foot treadle. So far as I could see, the Chinaman has not yet reached the stage of rotary tools.²

An acquaintance, quoting a private letter, refers to his friend as saying:

In every little shop in the jade street they [the Chinese] were turning lathes, or what answered for such, worked by the foot, a little disk cutting the jade, the disk coated with jade powder, or possibly with emery, of which the Chinese make much use, the disk moving fast enough to be nearly invisible. The cutting was slow. We went through the street after breakfast; then went on some expedition, and passed through again before night fell to see progress on the pieces. The work of a day was hardly appreciable—a minute pile of dust, a trace on the stone. We were told by the Chinese that the jade had always been cut in that fashion, using different forms of cutting tools—sometimes boring, sometimes gouging, sometimes chiseling, and so on. I do not think the Chinaman has diamonds or diamond powder.

While experimenting with drills and drilling material, I accidentally devised a drill which does some work with great rapidity. It is a plain, straight shaft, having a disk upon it as in fig. 100, though the shaft is not over 10 inches long. Placing the disk near the middle of such a shaft, and using a headpiece such as is used with the bow drill, a string was tied to the shaft near the disk. The point of the shaft being placed on the object where it was to be bored, and the headpiece attached to the shaft, the string was wound from four to six times around the shaft; with its end held in the right hand, while the left pressed gently on the headpiece. Drawing the strap firmly the force was increased as the strap unwound; the impetus thus given was sufficient to rewind the strap. The same force was then again applied, and so the work progressed by the winding and unwinding of the strap. The string is steadily pulled until it is almost entirely unwound from the shaft, when a relaxation of tension enables the motion gained to rewind the string.

¹John Jacob Holtzapfel, "Turning and Mechanical Manipulations," IV, p. 16, fig. 18.

²Florence O. Driscoll, "How the Chinese Live and Work," *Century Magazine*, November, 1894, p. 69.

The sand in the hole is moved back and forth, thus continually grinding the perforation deeper.

Fig. 143 represents this drill, which in some respects is superior to other drills, certainly increasing greatly the possible revolutions of the drill shaft in a given time. The principle upon which this tool works is very similar to the pump drill, although the power is applied in a slightly different way.

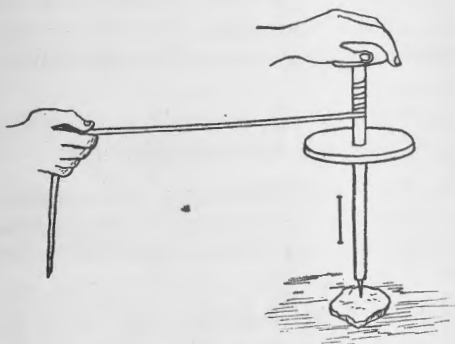


Fig. 143.
TOP DRILL.
Cat. No. 84237, U. S. N. M.

latter top or drill consists of a lenticular disk of grayish buff stone.¹ This specimen is referred to here, as it should be included in a study of the development of drills.

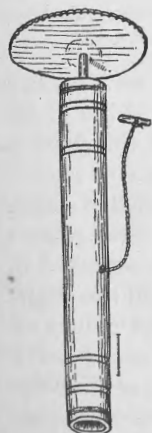


Fig. 145.
TOP USED ON MASK.
Bristol Bay.
Cat. No. 2985, U. S. N. M.

Fig. 14 represents apparently a top having a willow handle, from Bristol Bay, which works upon the identical principle of the drill above described (fig. 143), yet the specimen, eight inches long, having a disk with a diameter of three inches, was probably intended to be worked on the top of a mask, in the dance. The string passing inside the mask, the top being fastened to the top of the mask, and then passing inside the blanket, the string is pulled and the whirligig is put in motion and continued while the dancer pulls the string.

Fig. 146 represents a top or whirligig from Utkiawin, made from the top of the horn of a mountain sheep, and has been described by Mr. Murdoch.¹ The shaft of this plaything is of bone, firmly attached by wedging. Over this shaft a bone, larger than the shaft, fits loosely and has a hole bored through its side. Through this hole it is intended to pass a string and wrap it several times

Mr. C. H. Read describes a "teetotum" or "top" from Murray Island, Torres Straits (Papua), fig. 144, which is interesting as showing an implement embodying the principle of the disk drill as above described. The disk of this



Fig. 144.
PAPUAN TOP.
From a figure by C. H. Read.

¹ Journal of the Anthropological Institute of Great Britain and Ireland, xvii, p. 89, pl. 4, fig. 1.

² Ninth Ann. Rep. Bureau of Ethnology, p. 376.

around the shaft, as a boy winds his top. A handpiece or button affords a firm grip of the strap with the right hand, while the left hand holds the bone fitting over the shaft. The string being pulled out its entire length by a steadily increasing force, a considerable velocity is attained. The string not being tied tightly to the shaft, the weight of the horn detaches the top and shaft from the outer bone and the principle of a complicated toy is attained.

The writer is informed by Mr. Stewart Culin, of the Museum of the University of Pennsylvania, who is an authority on games, that this top is well known in Japan and China, where it is called the "tumbos" or dragon fly. The principle of these tops was known in a period prior to recorded history, and may be traced back on the monuments of Egypt certainly to the fourth dynasty.

The two tops appear singularly out of place in Alaska, for no other object of this nature is known elsewhere on the continent, so far as I am aware. They have in some way been imported into Alaska from Japan, probably by the Russians, though possibly by other travelers, traders, or hunters.



Fig. 146.

TOP MADE OF HORN OF MOUNTAIN SHEEP.

Cat. No. 89807, U. S. N. M.

BOW DRILLS.

There is a great variety of bow drills in the U. S. National Museum, gathered chiefly along the Alaskan Coast. The bows are generally made from walrus ivory, and with few exceptions are ornamented by elaborate etchings. There are, however, others made from the ribs of deer, which are sufficiently curved and suitable in shape. Here and there we encounter some other bone which has been made to answer for a drill bow.

These bows vary greatly in dimensions, from that shown in fig. 147, which is about 6 inches long, to those 20 inches or more in length, which are highly ornamented. The specimen here given is from Alaska, the bow being scraped into shape from an ordinary animal bone and decorated on each side by a zigzag line cut into the bone. Into this line lamp-black or soot has been rubbed so as to make the pattern prominent. A hole has been cut through each end of the bow for the string to pass through, which was then knotted at each end. At one end of the bow the thong was often left sufficiently long to tie to a headpiece, consisting, in the specimen shown in fig. 147, of one joint of the vertebra

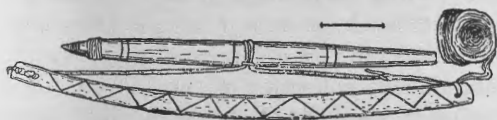


Fig. 147.

BOW DRILL.

Alaska.

Cat. No. 2064, U. S. N. M.

of a fish, so that it could be used without untying. The shaft is of soft wood, having a point lashed on with hide. Taken altogether, this is one of the neatest specimens which I have ever encountered. The size of it would, however, indicate that it was intended for very light work; or that possibly it was made for a child's tool, for we know that most implements of all peoples are at times duplicated in a diminutive size as toys.

The ornamentation upon the ivory drill bows is extremely varied in its range, from mere scratches or notches made in the ivory to ornamented carving and etching. These designs, etchings, and carvings appear to constitute quite an elaborate aboriginal school of art. At one place we encounter bows covered with lines, circles, angles, or curves, drawn with precision and elaborated carefully. In another place we see animal life portrayed with remarkable fidelity to nature; hunting and trapping scenes are delineated with minute precision, and caricatures of daily life are often portrayed with no mean artistic ability. These drawings often show a keen appreciation of the ludicrous.

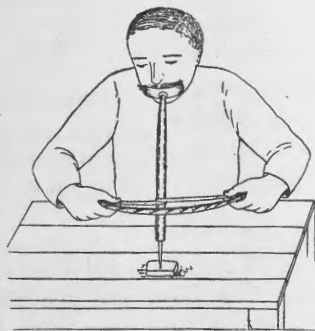


Fig. 148.

BOW DRILL FOR USE WITH TWO HANDS.

Norton Sound, Alaska.

Cat. No. 33178, U. S. N. M.

These drill bows have on them pictures of youth and old age; and from the frequent occurrence of dances and games etched into the ivory, we can see at a glance that these hyperboreans enjoyed at times pleasures with which their lives are not generally supposed to be associated. On these bows are seen whales floating, diving, and spouting, as well as the dead animal being dragged to the ice. Seal and walrus hunting scenes are well shown. Porpoise in schools;

ducks flying in bunches; deer feeding and running; the setting of traps, and the animals caught in them, are often seen, and no drawings appear more common than do those representing the dragging to shore, or to the ice, of captured game. While the Eskimo are especially famous for their drawing, and carried it to such an extent as to enable one to understand their daily life from the drill-bow etchings, it appears somewhat singular that in the magnificent collection of the U. S. National Museum there is not one drawing of the bear, although carvings representing the bear's head and his fore quarters are not uncommon on the mouthpieces of strap drill, or on ivory handles to the strap-drill thong, or to the handpieces of sled straps.

The presence of the white man is quite often indicated in Eskimo etchings by the steamship or by a gun.

These ivory bows are intended both for single and double hand work. When the bow drill is used with one hand, the headpiece is held in the left hand; when it is used in both hands, the teeth hold the headpiece,

as is the case with the strap drill, while the hands work the bow, as shown in fig. 148.

The bow of the drill is usually bored at the ends with a single hole about one-eighth of an inch in diameter; at other times there are two holes at each end.

To attach the string to the bow is quite a simple matter, a thong of skin being taken with a knot in one end. The thong is then pulled through the bow until stopped by the knot. Then the thong is passed through the hole at the other end of the bow only far enough to leave the string sufficiently slack to wrap around the drill shaft. Any superfluous string is wrapped around the end of the bow or is cut off.

The employment of these ivory bows is due entirely to surroundings, for the small limb of a tree, or even a straight stick, makes equally as good a bow as does the best ivory. Wood, however, in the Arctic is exceedingly scarce, and as a consequence the natives turn to the natural supply of ivory and bone.

Fig. 149 illustrates a bow drill from Alaska, with all of its parts complete, and presents the tool in its simplest form. The shaft is of wood, and is one of those which has already

been represented. The bow is often the rib of a deer which

has been scraped smooth and polished, the headpiece fitting the hand comfortably, being a pebble of fossil ivory in which a socket for the shaft has been worn.

Fig. 150 is an excellent illustration of the drill bow in use. The left hand holds the pebble of fossil ivory, the headpiece; the back of the bow rests against the inner part of the hand; the thumb, index, and middle finger of the right hand grasp the thong. This thong, being possibly too loose, is drawn toward the bow by the fingers until sufficiently tight to cause the shaft to revolve as the hand is moved away from or toward the body, alternating with an easy motion, causing the shaft to make from 250 to 350 revolutions per minute, or even more, depending upon the diameter of the drill shaft and the rapidity of the movement of the arm. The larger the diameter of the shaft the fewer necessarily are the revolutions.

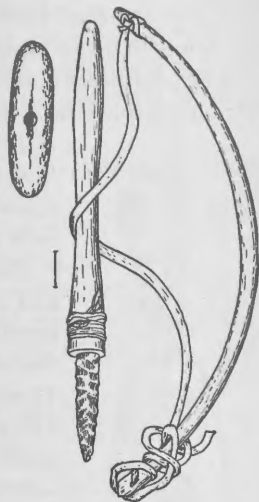


Fig. 149.

BOW DRILL.

Alaska.

Cat. Nos. 24544, 89627 and 48927, U.S.N.M.

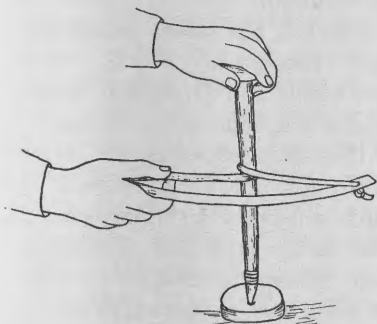


Fig. 150.

SINGLE-HANDED BOW DRILL IN USE.

The simplest of drill bows are those from Alaska which are made from the ribs of deer, and are about 18 inches long, seven-eighths of an inch broad, and one-fourth of an inch thick, upon which are carved animals or men not unlike certain carvings from the caves of France. The holes in the ends of these bows of deer rib are usually cut instead of being bored, as is almost always the case with bows of walrus ivory.

The shaft-hole in the headpiece must be sufficiently deep to prevent the shaft from slipping out as the bow is moved backward and forward, and to keep the shaft upright. It is proper that the socket should be sufficiently large to allow free play to the shaft.

The headpiece may consist of stone, bone, or wood, though it is usually of a hard material. In wooden headpieces; however, the friction of the shaft wears the socket rapidly, and consequently we find the socket stones of these headpieces similar to those used for the strap drill and the double-handed bow drill.

The socket stones are, with few exceptions, made of soft stone such as steatite or serpentine. There are several specimens of bow-drill headpieces made from fossil ivory which has been waterworn into pebbles. These are usually from St. Lawrence Island, Alaska. The only artificial work upon these headpieces is in the shaft holes, which, as a rule, are worn smooth by the revolutions of the shaft until they are polished, and at times worn entirely through.

Many of these socket stones have been selected because of their color more than for any other reason—bright green, white, jet black, and bright red appearing most often. The green specimens are frequently prettily mottled with light-colored veins, which lend attractiveness to the stone. The headpieces of the bow drill quite commonly consist of a single stone, the only apparent essential being that they should comfortably fit the hand. Even to this there were exceptions, however, for in one instance (fig. 147) the vertebra of a fish was employed, as already stated; in another (fig. 151) a water-worn ovoid white limestone pebble was selected, around the periphery of which a groove has been cut into the stone; into this groove a string made of split hide, probably seal, was neatly bound, and so lashed and twisted as to form a free loop at the end, by means of which the stone can be suspended, it being used also as a sinker, and is from Nuniwak Island, Bering Sea. The Alaskan Eskimos availed themselves of the best material which the country afforded, which was usually stone of some kind. They were not so fortunate as were the natives of Egypt, who certainly for the past four thousand years have employed the same drill, the headpiece of which was furnished by the dom-nut, which they are said to have used invariably.



Fig. 151.

STONE SINKER USED AS
HEADPIECE FOR BOW
DRILL.

Nuniwak Island, Be-
ring Sea.

Cat. No. 16176, U. S. N. M.

Nothing is more common than to find headpieces of the strap drill in the most unlooked-for places, one of which (fig. 152) is here shown, where a socket has been worn into an ivory knife handle.

The bow drill consists, as has been shown, of four parts—the shaft, the headpiece, the bow, and its strap. Except for the bow, it is identical with the strap drill. Therefore the bow may be considered as an advance upon the strap drill. The length and diameter of the shaft appear to be a matter largely governed by the individual tastes of the maker of the tool, and the work which it is expected to do. These lengths vary from 6 to 20 inches, with diameters of from one-eighth to three-fourths of an inch. Any stick will answer for the bow of a drill, though a curved one appears to have been usually employed by the American Indian.

While the natives of Alaska use the bow drill more generally than any other sort, it is undoubted that the strap drill can be made to work in positions in which it would be impossible to run a bow drill.

It has been alleged that the Eskimo cut their ivory at times by means of rows of drill holes. Anyone at all familiar, however, with the working tools of the Indians, and who is aware of the facility with which they sawed stone, would never expect to find a piece of bone bored in two, except it were done through an idle waste of labor, for sawing would occupy but a small fraction of the time which the boring would require.

Many persons appear to be under the impression that curved shells, such as are at times found in California with holes bored through them, have been bored around the curve, and it appears most difficult to convince them to the contrary. The writer is not prepared to prove positively that curved lines are never bored, but does assert that, unless it be along the line of a soft heart of wood, or the column of shell when the central portion is much softer than the part outside of it, such curved lines can not be perforated.

By means of a bristle a layer might be perforated which was softer than the parts above and below it, though the workman could not prevent the bristle going to the right or left of a straight line, and consequently there would be no object in such work. As shown with the column of the Busycan, the holes are bored at an angle to each other, and where they meet is not shown on the exterior of the curve. (See fig. 4.)

There have been many interesting experiments made with aboriginal boring tools and the methods of boring, one of the earliest of which was made by Prof. Charles Rau and described by him in the Report of the Smithsonian Institution for 1868.¹



Fig. 152.

HEADPIECE IN KNIFE-HANDLE.

Point Barrow, Alaska.

Cat. No. 89590, U. S. N. M.

¹ Rep. Smithsonian Inst., 1868, p. 392, etc.

The author there refers to such a drill as that represented in fig. 153, which Dr. Rau speaks of as an attempted restoration of the ancient Indian bow drill. It consists of a shaft upon which is a disk, in the rim of which is a groove for the bow of the drill to work in. Such disks are found among the stone implements of Scandinavia, with grooves around their peripheries, which possibly were intended for some such purpose, though it is extremely doubtful. Were the disk, however, intended for this purpose, it would have been worked with a much longer bow than is used in America.

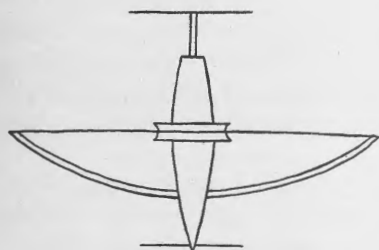


Fig. 153.
BOW DRILL.
From a figure by Rau.

Count von Wurmbrand several years ago described a drill with which he successfully perforated objects of stone by means of a shaft worked by a bow and string. This drill consisted of two pillars mortised into a block at the base and fastened there, and a crossbar at the top mortised through the pillars.

This crossbar he bored in the center and inserted a stick of wood through it. To the lower end of this shaft a piece of deer horn was bound, which reached to the block. He wrapped the end of the deer horn point with a string, so that it could be revolved with quartz sand and water with extraordinary results.¹

This drill is represented in fig. 154, and should make a good stationary drill frame, were there any means of bringing pressure to bear upon the shaft.

Prof. J. Heierli, of Zurich, Switzerland, has also made some experiments in the use of a bow drill worked after the manner which he describes in the eighth Pfahlbaubericht. The drill is quite ingeniously constructed, though it appears to me to have several superfluous attachments.

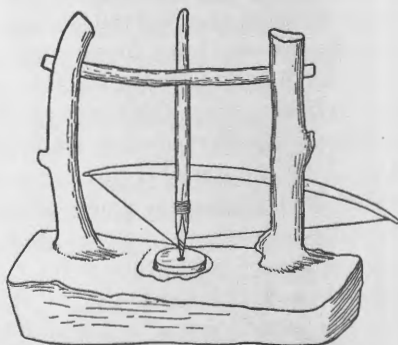


Fig. 154.
BOW DRILL.
From a figure by Wurmbrand.

The pile builder [he says] could bore in the following manner: He laid the stone which was to be bored through, upon the surface which was perpendicular to the direction of the bore, and surrounded the part where the boring was to be done with resin and pitch, in order that the boring cylinder might not slip out. This borer consisted of a soft round piece of wood, which had a tip of deers' horn at the top. The lower half of one cylinder was made of soft elder wood, while the upper portion

¹"Ergebnisse der Pfahlbau-Untersuchungen," Mittheilungen der Anthropologischen Gesellschaft in Wien, p. 117.

consisted of hard pine. The two parts were held together by strings, which were bound tightly around them. The cylinder was hollowed out below and quartz sand was put in the holes, as well as upon the place where the boring was to begin. Then the rod was placed upright and weighted down by another, a horizontal rod, which rested upon two posts, and upon which a stone hung to increase the pressure. The cylinder was revolved in the middle of a bow. The boring proceeded very successfully, but of course the hollow cylinder left a stone plug which may be noticed in some of the bore holes. It was necessary from time to time to substitute new cylinders of greater width.¹

The above constitute, so far as I am aware, the principal experiments made with the bow drill to reproduce ancient methods of work. The bow drill is still found to be a most useful tool, and is employed by jewelers, one firm using this bow and a soft-iron tube hacked around the edges, in connection with diamond dust, for boring jade. The use of the bow drill in America appears to be confined chiefly to the Alaskan and north Canadian aborigines, among whom it is quite common. The bowstrings are of hide, gut, or leather; the shafts are of wood, to which points of bone, stone, or iron are attached in a variety of ways, as herein shown. The Aleuts are said by Dr. Dall to use the bow drill quite extensively in their carvings.

Colonel Mallery also calls attention to its former use by the Inuit of Alaska in their carvings of bone and ivory, though they now use a cutting tool, or graver, for the purpose.²

Dr. Hough calls attention to Norton Sound as being the southern limit of this drill, which is used throughout the country ranged by the Chukchis.³

Fig. 155, from Tylor, shows the bow drill used as a fire drill. The headpiece, he says, "is a large slab of stone." Such a headpiece is certainly quite unusual, yet the Eskimo are known to employ any object which may be made to serve the purpose. Man's ability to adapt himself to circumstances and to employ various means to supply a present want is nowhere more observable than in the great variety of things which at one time or another have been made use of as headpieces for bow drills.⁴



Fig. 155.

ESKIMO BOW DRILL.

From a figure by Tylor.

¹J. Heierli, "Der Pfahlbau Wollishofen," Mittheilungen der Antiquarischen Gesellschaft in Zürich, XXII, part 1.

²Garrick Mallery, Fourth Ann. Rep. Bureau of Ethnology, p. 48.

³Rep. Smithsonian Inst. (U. S. Nat. Mus.) 1888, p. 556.

⁴E. B. Tylor, "Early History of Mankind," p. 244.

Fig 156, from Seebohm, shows an Ostiak drill presenting the peculiarity of having two strings to the bow. Of this drill it is to be regretted there appears no explanation in the text. The headpiece, if represented in the figure at all, is in the upper end of the handle. Another peculiarity of this implement is the manner of its attachment to the bow, which would appear to hinder the best work from being

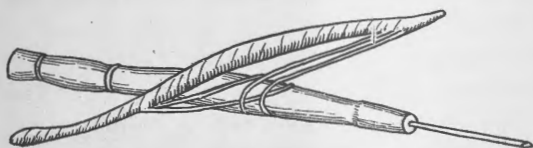


Fig. 156.
OSTIAK DRILL.
From a figure by Seebohm.

attained, or of maintaining the necessary tension to the bowstrings upon the shaft. This would, however, be greatly obviated if the workman, when the tension became slack, pressed the bow toward the body, as the increased size toward the head of the shaft would take up the slack of the string.

Fig. 157 represents an extremely interesting specimen of the bow drill, apparently of the same character as shown by Seebohm, which was purchased at the Chicago Exposition. The specimen is from the Laccadive Islands, and, though it is entirely of wood except for the iron point, has decided advantages, under certain conditions, even over a modern brace and bit, as it could be worked in the angle of a box where the brace and bit could not be used. The shaft of this drill is, as can be seen, of varying diameter, so turned on the lathe in order to increase or decrease the velocity, or possibly for increasing or decreasing the tension on the bowstring, on the principle suggested in connection with the drill shown in fig. 156. The pin with its mushroom-like head is fastened tightly into the drill shaft. The headpiece is in two parts, into which the pin in the shaft fits as though in a mold, one-half of which is shown through its longitudinal section. It will be seen that the two parts of the headpiece, being fitted together and held by the left hand, or tied, would allow free play to the pin, and consequently to the shaft.



Fig. 157.
LACCADIVE BOW DRILL.
Cat. No. 168665, U. S. N. M.

In Spain stone is said to be bored at present by means of a bow with a nut on the head, a spindle, a spool, and a bow. The nut is pressed against the breast, the string is wrapped on the spool; the bow being worked causes the spindle to revolve, as we see in the Ostiak and Ceylonese specimens. This nut would appear possibly to work similarly to the head of the Finnish auger shown in fig. 121. The writer, however, regrets his inability to reproduce an illustration of this implement, only knowing of it by hearsay.

Mr. R. D. L. Mohun, just returned from a journey on the Kongo, informs the writer that he has seen the Basongo Mino natives of the Kongo Free State use the bow drill with a wooden shaft, iron point, wooden bow, and thong of antelope hide.

Judging from their paintings and glyphs, the Egyptians have used the bow drill since the earliest times. Fig. 158 shows a small bow



Fig. 158.

ANCIENT EGYPTIAN DRILL BOW.
Abbott collection, New York Historical Society.

of an Egyptian drill with its original cord upon it, now in the Abbott collection of early Egyptian antiquities. This bow is apparently of cedar wood

and is about 20 inches long with a width of $1\frac{1}{2}$ inches and a thickness of one-half inch. This specimen is extremely interesting, and has its ends carefully carved in imitation of hawk heads. The size of the bow is not such as to allow it to be used for shooting arrows, and the wood from which it is made does not appear suitable for being bent.

In fig. 159 is shown another drill bow with its cord yet on it. This specimen is also in the Abbott collection, and is said to be from Thebes. The shaft is perfectly straight, and is made from a reed, hollow through its whole length, with notches at each end; but the notches, it should be observed, are on opposite sides of the bow. To the end of this specimen is held a thin, flat piece of light wood, through which the string was carried and tied after it had passed in one end and out of the nearest hole and into the hole of the opposite side at the other end. From experiments with a similar tool this diamond-shaped piece appears to be intended for the purpose of taking up the slack of the bowstring in working. This bow, if it may be so designated, is about 16 inches long with a diameter of one-half an inch. The notches on opposite sides of the bow allowed the cord on the shaft to wind and unwind with the greatest ease while being worked, and were they on the same side



Fig. 159.

ANCIENT EGYPTIAN DRILL BOW.
Abbott Collection, New York Historical Society.

the string would work less regularly. There is an object similar to the above in the same collection, which is made from a piece of wood, in imitation of the reed bow. This was done by drilling a hole lengthways of a cylinder and then cutting notches in it on opposite sides, as those are in the reed specimen. This hollow cylindrical wooden bow is about 8 inches long with a diameter of one-half inch. This latter specimen is from Sakkarah, and both must be very ancient. The little diamond-shaped block was found to fit the hand comfortably and this bow works as well as any bent one would. As the cord became

slack the little block could be slipped by the ball of the hand and the little finger, and so be worked to advantage until further tightening became necessary.

In fig. 160 is shown one of the most interesting objects in the Abbott collection, the collection itself being one of the best in existence of articles of Egyptian household use. The specimen is said in the catalogue to be "an instrument in wood used by the Egyptian priests in making offerings to their gods—one end terminating



Fig. 160.

ANCIENT EGYPTIAN DRILL BOW.

Abbott Collection, New York Historical Society.

in a hawk's head, the other in a human hand."¹

The specimen is said to be from Sakkarah and to be very ancient.

This object is of too small a size to admit of anything being carried on the hand end of the implement, as represented in fig. 161, which is an instrument commonly seen in works on ancient Egypt. The small object, like a flower pot, is said by Egyptologists to represent burning incense.



Fig. 161.

ANCIENT EGYPTIAN DRILL BOW.

From a figure by Lepsius.

Pictography entered more largely into the written language of Egypt than into that of any other nation of which we have knowledge, and everywhere we see the action represented accompanied by an illustration—if of people at work, of the tools they are using and the article intended to be made—so that one may understand a great deal of the pictographic writing of ancient Egypt. In the implement here shown we may imagine pictography carried to a high art. Fig. 161 is emblematic

of fire, its source, and its production. The implement is the bow of the fire drill; the hawk is emblematic of the sun, the source of heat; the human hand has produced the fire, which is offered to the god.

If the bows of Egyptian origin which have been referred to in this paper are examined, the author believes that small doubt will be enter-

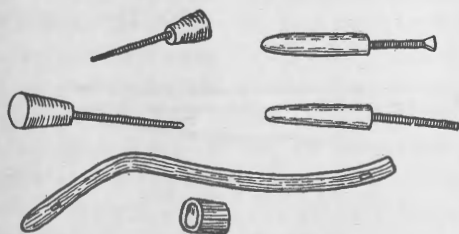


Fig. 162.

THEBAN BOW DRILL AND TOOLS.

From a figure in Wilkinson's "Ancient Egyptians."

tained as to the accuracy of his suggestion that the implement represented in figs. 160 and 161 is the handle of a fire drill. In fig. 162 we have a bow drill and tools found in the basket of a Theban workman, along with drills, chisel, saw, mallet, and skin bag. The same drill is

¹ Catalogue of the Abbott Collection of the New York Historical Society.

used to-day by the cabinetmaker of Europe.¹ This drill bow, as we see, has a curved back; but, judging from the differences shown, it was only a matter of taste with the person working the drill as to whether it should be straight or curved. This specimen is now in the British Museum, and is said to date from the twelfth dynasty.

Professor Petrie calls attention to the finding of the head of the bow drill at Medum, dating from about the time of the fourth dynasty.² In fig. 163 is shown a bow drill which was used in Egypt. It was found at Illahun, in the Nile Valley, at the entrance of the Fayum, in the excavations made on this site in 1889-90 by Professor Petrie, who says:

Hitherto we had never known how the Egyptians obtained fire, as there is no sign of this on the sculptures, nor do they seem to have attached any significance to fire making. In this town I found several steiks with burnt holes, made by drilling fire, as many races do at present. The Egyptians did this probably with the bow drill, with which they were familiar and of which specimens were found here.³

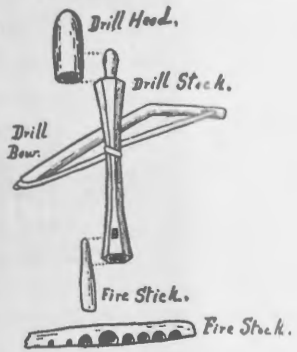


Fig. 163.
BOW DRILL.
Illahun, Egypt.
From a figure in Wilkinson's "Ancient Egyptians."

In this specimen we see the shouldered shaft, a place in the end for changing the bits, the headpiece for the dom-nut, as well as the bow and strap or string—as perfect an outfit for the drill bow as could now be devised.

Fig. 164 represents, according to Holtzapfel, a workman piercing three small holes close together by a rather unusual method. The drills are separated by the finger of the left hand, and the bowstring envelops them in succession, the pressure being given by the weight of the enlarged mass at the top.⁴ Rossellini refers to this figure as being a representation of a willow worker.

It is every day becoming more patent that the evolution of tools has been but slight since a very ancient period, judging from the discoveries in the caves of Europe and in Asia and

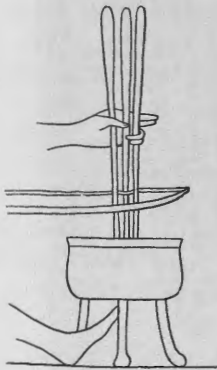


Fig. 164.
DRILLING OR WILLOW WORKING.
From a figure by Holtzapfel and Rossellini.

¹Sir J. Gardner Wilkinson, "The Ancient Egyptians," II, p. 112. Revised by Samuel Birch, Boston, 1857.

²"Ten Years' Digging in Egypt," p. 145.

³Ibid, p. 119.

⁴John Jacob Holtzapfel, "Turning and Mechanical Manipulations," London, 1879, p. 3, fig. 2.

northern Africa. Carpenters, says Petrie, are represented as using the bow drill under the fourth and fifth dynasties.¹

In fig. 165 we have an Egyptian working a bow drill with a donut headpiece and a bow apparently of a pattern different from any other that has come under my observation. The peculiarity of this bow appears in the hand piece, the cord being held by the hand in a manner which enabled it to be tightened at the workman's option, the figure being drawn after Wilkinson.²

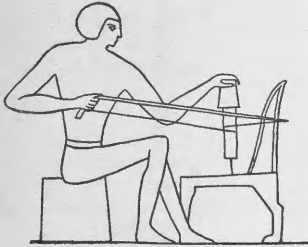


Fig. 165.

EGYPTIAN DRILLING A CHAIR.

From a figure in Wilkinson's "Ancient Egyptians."

a represents particularly the bit which pierces the hole; it is of thick wire, sharp at the point, having a ring at the base which fits in the handle. The handle is seen at *b, c, d, e*; it is round and is turned by means of a bow. The cord of the bow turns on the part *e*. *d* is a shoulder, which keeps the handle below the crosspiece of the frame. *b* is a ring of wood or of metal, loose on the part *e*, which holds in place the bit of the drill. This machine ordinarily is about one meter, or slightly over, in height.³

There is little in this illustration explanatory of the bow drill, yet it is offered as being possibly a valuable bit of evidence when we come later on to consider the Egyptian disk drill.

The writer can lay claim to very little knowledge concerning Egyptian manners and implements under the ancient dynasties; yet, from an examination of the great works of Champollion, Lepsius, Rosellini, and the publications of the Egyptian Exploration Fund, and other almost equally valuable records of the monuments of Egypt, there appears to be proof positive that the Egyptians from the fourth dynasty, if not earlier, to the twenty-fifth dynasty were familiar with

The device shown in fig. 166 is said to be a machine for boring holes in pipes. The machine is composed of a frame marked *ff*, which is made to receive one or several drills. *a* is a drill, the handles of which and its different parts are marked *b, c, d, e*.

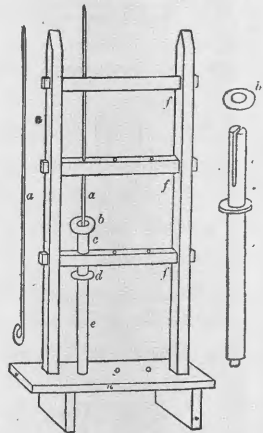


Fig. 166.

MODERN EGYPTIAN FRAME FOR STRAP DRILL.

From a figure in "Description de l'Égypte," Vol. II.

¹Journal of the Anthropological Institute of Great Britain and Ireland, XIII, p. 98.

²Sir J. G. Wilkinson, "The Ancient Egyptians," 1854, p. 94; also "Monuments de l'Égypte et de la Nubie," II, pl. 185.

³"Description de l'Égypte," Paris, 1826, II, pl. 30, fig. 17.

drilling in all its details. This includes the shaft drill, bow drill, and disk drill, all of which commonly appear upon their monuments.

The date of the first use of the wheel in Asia Minor or in northern Africa is an interesting problem to study, and when the proposition is solved it will be shown that the drill is much more ancient than has been heretofore supposed. On old coins or seals the straight lines are so straight and so fine as to indicate clearly the delicate marks of a wheel rather than those tools held directly in the hand. All carving and sculpture had their infancy in incised lines, and the intaglio or relief must both be considered as an advance upon mere outlines; but whether intaglio or relief would be entitled to precedence on the score of age may be open to some doubt. In *pietra dura*, in small stones, intaglio would appear to be most ancient, but likely this would apply only to carving as distinguished from its kindred but distinctly separate art, sculpture. In sculpture, the surfaces being larger, the reverse of what would be the case in working small stone would appear as the natural order of development, and therefore we would find relief probably, but not certainly, preceding intaglio. The evidence that wood, steatite, shell, bone, and marble were the substances first carved would appear to signify an absence of ability to treat the tougher substance for want of a cutting material of sufficient hardness with which to work it. This material would be supplied by corundum. That perforations appear in any and all early carvings everywhere encountered is most natural, for a small object by being perforated for suspension could be attached to the person to prevent the chances of loss.

In accuracy of work performed, the "bow drill" appears equal if not superior to any of the others. This drill, I have been informed by an expert machinist, was, up to a very recent date, used exclusively in boring the vents of heavy cannon, a work in which the utmost accuracy was necessary. The bow-drill shaft, if it bound on one side of the perforation more than on another, would be more quickly noticed by the operator, my informant said, than would be the case with the other drills. Experiments have not, however, demonstrated satisfactorily the accuracy of the last statement, and the bow drill can not be said to be superior to the pump drill or the straight drill, yet it must be admitted that the experiments have never been made with any especial view to the ability to bore an unusually accurate hole. It has, however, been observed in the use of all drills that a very slight deviation from a straight line would cause the shaft to drag, by binding more on one side than on another. Such binding would be instinctively, if not deliberately, corrected by moving the shaft into a line perpendicular to the plane surface of the object being bored. Of the Indians of New England, Williams said, "before they ever had awl blades they made shift to bore their shell money with stone."¹

¹Roger Williams, "A Key to the Language of the Indians of New England," p. 144.

Fig. 167, drawn after Holtzapfel's illustration, represents the method employed by the Persian turner, where the centers were made to pass through the ends of an open box, the edge of which serves to support the tool. They are raised or lowered to suit work of different diameters in a series of holes pierced in a vertical line. Small works are set in motion by the bow both by the Persian and the Indian. For those of larger diameter, both use a cord pulled by an assistant; but when using the cord, the Persian lathe (fig. 140) is fixed by means of stakes, to prevent its being pulled along the ground.¹

Fig. 168 represents a lathe from Morocco in the U. S. National Museum. It consists of an iron bar as a foot

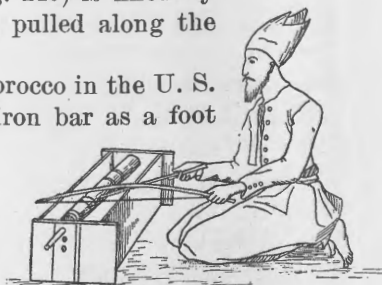


Fig. 167.

PERSIAN TURNER.

From a figure by Holtzapfel.

and tool support, and two iron pins for centering the objects which are to be turned. The platform consists of a board three feet long with a width of 18 inches and a thickness of $1\frac{1}{2}$ inches, upon which are tacked two 1-inch straps of wood, on which the blocks on each end run in the strips and on which the pins are firmly attached. The wood to be worked is made to revolve by means of

a bow four feet long worked with the left hand, while the right hand and foot hold and guide the tool. The bar of iron does double duty of rest for the tool and prevents the centers from slipping, which they would do were the foot pressure released.

The potter's wheel was understood by the ancient Egyptians, and is represented on

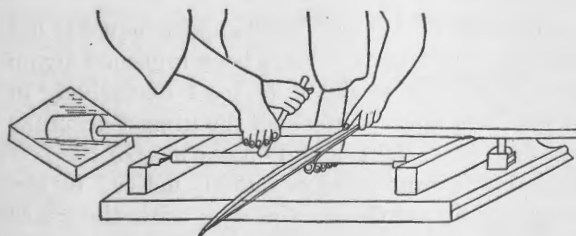


Fig. 168.

LATHE FROM MOROCCO.

some of the most ancient monuments. Homer, in the *Iliad*, says of it—

They with well-tutor'd step now nimbly ran
The circle swift, as when before his wheel,
Seated, the potter twirls it with both hands.²

Mr. Alfred Hippisley says: "It is said of the Chinese that, under the dynasty of Chu, circa 2200 B. C., there was a director of pottery, and the process of fastening on the wheel and molding are distinguished."³

¹J. J. Holtzapfel, "Turning and Mechanical Manipulations, London, 1879," IV, p. 7.

²Cowper's Translation of the *Iliad*, eighteenth book, line 736.

³Hippisley, "The Ceramic Art in China," Rep. Smithsonian Inst. (U. S. Nat. Mus.), 1888, p. 388.

THE PUMP DRILL.

The pump drill differs essentially from all other boring tools, and appears to be widely distributed. It is used by the American and European. It is popular with the Pueblo Indian of New Mexico, almost to the exclusion of other drills. It is known in the far north and among the Pacific islands, and also to the Chinese.

The complete drill is shown in fig. 169. It consists of a shaft, a disk, a cord, and a bow, in addition, of course, to the point and its lashing. There is naturally some difference in the parts of this implement in different countries; the shaft, for example, varies in length from 12 to 30 inches, and in diameter from one-quarter to one inch. The bowstring may be tied to the shaft, or used in a notch in the end of the shaft, or be run through an eye, as in the illustration; in other words, it varies to suit the taste and surroundings of whosoever uses it.

Fig. 170 shows the drill of the Pueblo Indians. A shaft about two feet long by one-fourth of an inch in diameter is run through a disk, usually made of light wood, of a diameter from two to four inches, with a thickness of not over an inch. The end of the drill shaft is split to receive a triangular spall of chalcedony, which is bound on by a buckskin thong.

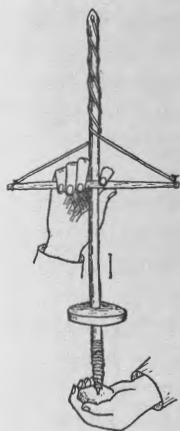


Fig. 170.

PUEBLO PUMP DRILL.
Cat. No. 134159, U. S. N.-M.

The bow of the drill has a hole in its center through which the shaft is allowed full play as it is lowered and raised in working it. The bowstring is tied around the ends or through holes at the extremity of the cross-piece; the disk attached either by wedges of wood, by a packing of skin, or by a slight enlargement of the shaft. In working this drill, its point is placed in a slight depression made by tapping the object intended to be bored with a hard stone point sufficiently to but slightly roughen the surface, which is all that is necessary to hold the drill in position. The index and middle fingers of the right hand being placed on either side of the shaft, or all the fingers being employed as shown in the drawing, the palm of the hand held downward, the thumb is lightly pressed up against the under side of the bow, and the string is wound around the shaft as far as it will go by turning the disk. Here the work begins; a gradually increasing downward pressure of the hand bearing on the bow unwinds the string from the shaft, giving a rapid motion to the drill. The pressure is then relaxed just as the string is unwound, allowing the impetus of the disk to wind the string



Fig. 169.

PARTS OF PUMP DRILL.
Cat. No. 47265, U. S. N. M.

in the reverse direction, when the movement described is renewed. The motion of this drill is an extremely easy one, and not being tiresome may be kept up for a long while. If the fingers become cramped, one naturally relieves them by using the whole hand, as in the figure, or by changing hands and working with one while the other rests.

The earliest experiment made with the pump drill of which the writer is aware was that described by Dr. Charles Rau in the Report of the Smithsonian Institution for 1868, page 392, where the pump drill used by him is fully explained. With infinite pains Dr. Rau perforated a hole $1\frac{1}{4}$ inches in diameter through a block of diorite, one-half, approximately, being bored from each side. This occupied all his spare time during a period of two years, and he thought it would require as long again to enlarge the hole to a uniform size throughout. Dr. Rau, at this time not being familiar with this drill as used by the Pueblos of the Southwest, built his drill as the fire drill is described by Morgan in his "League of the Iroquois," and here shown in fig. 171. This drill had a bow, with no hole for the shaft to run in, to guide its raising and lowering, as the pump drill should have. The doctor used a shaft one inch in diameter, and it is marvelous that he had the patience to carry his

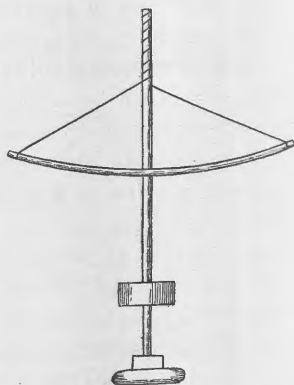


Fig. 171.

PUMP DRILL.

From a figure by Rau.

task as far as he did. The work was completed by the use of sand and water.

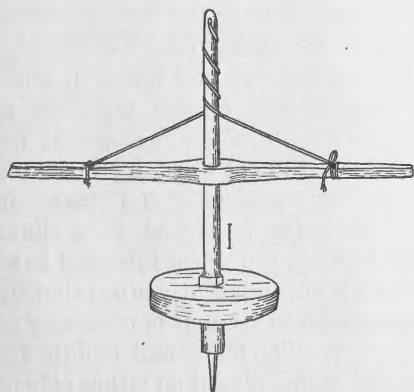


Fig. 172.

PUMP DRILL.

Finland.

Cat. No 167788, U. S. N. M.

Lieutenant Emmons refers to the Tlingit Indians of southeastern Alaska using this drill and also working the plain perpendicular shaft between the extended palms. The pump drill appears to be unusual, however, so far North, and it is known not to have come into general use in this locality.

The drill shown in fig. 172 is from Finland, and differs from pump drills known elsewhere in nothing except that the shaft is

squared where it fits into a corresponding hole in a heavy wooden disk. An iron bit is driven into the shaft and the crosspiece is quite rude, the bowstrings being attached through holes two-thirds of the way from the shaft to the end of the bow. The holes usually bored by the

Pueblos with the bow drills are quite small, these tools being generally used for drilling beads, and the Indians have instinctively if not intentionally built the machine to suit the work they wished it to perform. The Finn bored heavier objects with his drill, and consequently made a heavier implement. Possibly it may be that the supply of wood had something to do with the construction of this drill. There is a pump drill in the U. S. National Museum collection from California, furnished by L. Powers, and also one from Maj. B. Powell, from Utah. This drill is used by the Japanese also.

Nordenskiöld describes the pump drill as one of the means by which fire was made among the Chukchis.¹

Tylor refers to the pump drill with a stone point as being used on Bowditch Island in the Pacific. Mr. Turner describes it in the Samoan or Navigator's Islands.²

There has recently been added to the U. S. National Museum collection a pump drill from Antananarivo, in the island of Madagascar, with a stone disk three inches in diameter by a thickness of over one inch, very similar to many of the perforated balls from California.

Rev. Arthur Rigg refers to the great antiquity of the pump drill and its world-wide celebrity, and speaks of its being well known and used in the East.³

Modigliani also refers to the use of the pump drill, as illustrated in fig. 173, at the island of Nias, but speaks of it as a foreign importation. A difference which he notes in its construction consists in the perforated shell of a cocoanut, filled with stones, which is used for a disk. This tool had an iron point.⁴



Fig. 174.

CHINESE PUMP DRILL.
From a figure by Holtzapfel.

Fig. 174 represents the method by which the Chinese work the pump drill, according to Holtzapfel, who thinks it is probably as ancient as the bow drill. The Chinese, however, place the disk upon the head of the shaft instead

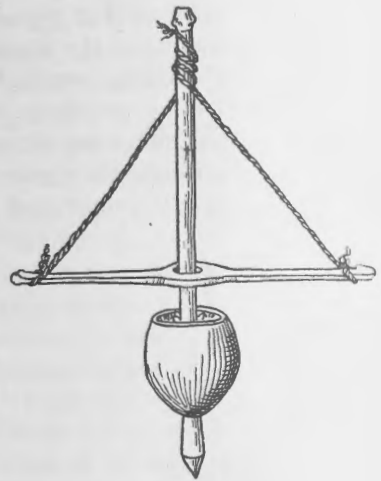


Fig. 173.

NIAS PUMP DRILL.
From a figure by Modigliani.

¹ A. E. Nordenskiöld, "The Voyage of the *Vega*," p. 490. Translated by Alexander Leslie, New York, 1882.

² "Researches into the Early History of Mankind," New York, 1878, p. 245.

³ Arthur Rigg, *Journ. Soc. Arts*, London, August 6, 1875, p. 804.

⁴ Elio Modigliani, "Un Viaggio a Nias," Milan, 1890, p. 587.

of lower down, as is apparently done by all others who use this drill. Experiments made with the Chinese implement were not entirely satisfactory, as the disk on the head of the shaft causes an unsteady motion, not noticed when the disk is placed below the cross-piece.¹

Fig. 175 shows an iron pump drill of English origin, the only wood in it being that upon the knobs on the ends of the crosspiece, which are protected by copper washers. The shaft has an eye in it, as is the case with the more primitive form of this drill. A leather thong is drawn through two plates, which fit to the iron bow in which there are eyes. Through these the thong is fastened. The disk is of iron, filled in with lead to add weight, and in the end of the shaft a slot is left to allow of changing the bit. The method of attaching the bit to this implement appears similar to that employed in the Egyptian fire drill. (Fig. 163.)

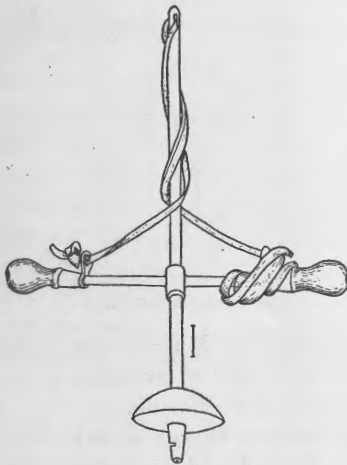


Fig. 175.

ENGLISH PUMP DRILL.
Cat. No. 167330, U. S. N. M.

It is difficult to define exactly the relationship of the pump drill to other drills, for the development seems to be upon entirely different lines, and apparently owes its origin to a loose string of a bow being wrapped around an arrow, which, being pressed upon, caused the arrow to revolve. A disk of any character would complete this unique tool.

The writer sees no close relationship between this drill and the bow drill, nor any necessary connection from the one to the other. The pump drill, however, does not appear such an implement as could have been evolved from the strap drill of the Egyptians or a drill of the character of that shown in fig. 143. There is a drill in the U. S. National Museum collection from Sitka, Alaska, which consists merely of a shaft of wood with a disk of whalebone or fossil ivory, which is somewhat of an enigma, in that it is said to be a fire drill complete. The disk would add nothing to its use as a fire drill. The implement is identical with the shaft and disk of the pump drill, though there is no evidence of its being used with either a bow or drill point.

It will be observed that there is a great difference in the disks of pump drills; those of the American Indian are composed of very light wood, whereas the disks of European drills are unusually heavy, as noted in the case of fig. 175. In the former case, the holes drilled

¹J. J. Holtzapfel, "Turning and Mechanical Manipulations," London, 1879, IV, p. 4, fig. 3.

were small and made through comparatively soft material, whereas the heavy disk is intended for cutting stone or iron, the additional weight of the disk adding greatly to the impetus given and consequently to the ability of the tool to cut heavier material than could one having a light wooden disk.

Were the pump drill of indigenous origin, it is believed that it would be found generally distributed throughout the continent. Such investigation as the writer has been able to make on the subject indicates clearly, however, that it is of foreign growth.

Fig. 176 shows a curious drill and unique in the collection of the U. S. National Museum. The figure well illustrates the character of this drill, which is worked by moving the disk, which has free play up and down the shaft, as the bow is ordinarily used with the pump drill. The point is of iron, the shaft of extremely heavy wood; a long string or thong is drawn tightly over the shaft. It would, however, answer equally well were it carried through an eye at the head of the shaft, as is so often done with the shafts of pump drills. Each end of the thong is then passed through a hole on opposite sides of the disk and tied near the bottom of the shaft in such a manner that as the disk is pressed the shaft revolves and winds the string on the upper part of the shaft as the disk descends. The pressure being relieved, the weight of the shaft causes it to revolve from the impetus given, thus tightening the string on the bottom of the shaft until the pressure is again brought to bear on the disk.

The string is kept taut, which enables the drill to work with some ease. It revolves little if any faster than would the straight shaft held between the outstretched palms, and only cuts as the downward stroke is given, as with the shaft drill; yet the facility with which this drill works gives it interest, as it is used by the natives of a large tract of country.

This interesting drill was collected by Mr. N. J. Purcell, at Round Valley Agency, Cal., and is used for drilling small holes through hard white shells. The writer is informed by Mr. Purcell that he has seen the Concow, Ukie, Little Lake, Redwood, and Pitt River Indians all work with this tool. They now use, he says, the points of files to the drill, where formerly they used stone points. After the drill has started, one hand is used to hold the shell and the other to work the drill by moving the disk up and down. The shaft is in no way weighted; the strings are made of the inside bark of a weed, which grows in rich, damp glades (probably the Indian hemp). This drill may be made to make from seventy to ninety revolutions a minute, and the only redeem-



Fig. 176.

DISK DRILL.
California.

Cat. No. 131259, U. S. N. M.

ing quality it possesses is that it leaves one hand free to hold whatever it is that is to be bored. In order that this drill should work to its best advantage, it will be appreciated that the string should be taut, the disk should have sufficient play to move freely, and the holes in the disk of a size to allow the strings to run easily, and the shaft should be of heavy wood.

While the pump drill appears to owe its origin in America to recent European importations, this modification of the pump drill seems to owe its birth to aboriginal American influences.

In trying to work a drill of this character, the writer at first found it was most difficult, and was strongly inclined to doubt its being a drill at all, notwithstanding that it was vouched for by good authority, but after a few days' experiment he got the implement to run with perfect ease, and it is highly probable that further work may develop qualities in this tool not yet appreciated.

The crosspieces of pump drills vary considerably, being governed somewhat by the work which the tool was required to perform. At times they are of iron, and again of a round stick of wood turned on a lathe. The crosspieces of the Pueblo pump drills are flat and thin, varying from 6 to 9 inches in length, and from 1 to 2 inches in width, and one-fourth of an inch or less in thickness. They appear invariably with a hole through their centers for the shaft to run in. Sometimes the hole is cut, again it is burned, and at times it is bored. The ends of the crosspieces are usually perforated, yet sometimes they are pointed and notched, so that the strings could be tied instead of knotted through.

The shaft of the Pueblo bow drill is seldom bored, for the string or thong was commonly carried over the shaft-head and tied tightly, although specimens are found which work in a notch in the head of the shaft without tying. The string with which this drill is worked is usually of buckskin. The tribes who were apparently familiar with it were the Pueblos, especially the Zuñis, Siana, Silla, and Moki.

The weight of a disk need only be sufficient to cause such impetus as will rewind the string around the shaft when the pressure is released. The disks in the National Museum are chiefly of wood; there are, however, specimens of pottery. The wooden disks vary in diameter from 1 to 3½ inches; those of pottery are from 1 to 2 inches in breadth, by one-fourth of an inch or less in thickness.

EGYPTIAN DRILLS.

The bow drill has been shown by the several illustrations to have been known to the Egyptians from a period as early as the fourth dynasty. It must be admitted that the straight-shaft drill was its predecessor, being embodied in the principle of the bow drill.

Of the strap drill we find no evidence in Egypt in the form in which it is known to the Alaskan Eskimo, yet as the latter use the two drills,

the bow and strap, interchangeably, it would not be irrational to argue from this premise that it was so used by the Egyptians. This, however, might be combated as poor argument, were it not that we show by the quotation from the *Odyssey* that Homer knew of the strap drill; and where Ulysses describes his position, when he and his companions bored out the eye of the Cyclops, as "standing above them guiding the drill," as Kuhn says; or, to quote B. Theodore Buckley, "I, raised above on high, moved it around;" or, according to Cowper, "Myself, advanced to a superior stand, twirled it about, while the companions pulled the thong," requires no stretch of the imagination for us to see the strap drill working until the "roots of the eye hissed in the fire." It is a question among scholars whether Homer meant this description to be understood as of his own time, or whether it related to the time of the Trojan war. The writer expects to show herein the use by the Egyptians of a highly-developed strap drill, with disk attachment, at a period 2,000 years prior to the siege of Troy.

From the fourth dynasty up to the twenty-fifth, this drill was in general use, if the writer is correct, and it stands to-day evidenced more clearly than any other one thing upon many of the best-known monuments of Egypt. As has been shown by reference to the writings of the most celebrated Egyptologists, we know that stones were bored from a very early period in the Nile Valley, with holes through them of a diameter of 5 inches or more. Moreover, we know that these holes were bored with tubular drills. Professor Petrie thinks the work was done with the diamond drill, and that even then it required a pressure upon the drill of 2 or 3 tons to cut striæ in the granite of the depth often noticed in the cores from these holes. No explanation has been offered as to how so great a weight was moved, and if the writer's surmise is correct, no such weight was required to work the Egyptian disk drill; but, on the contrary, two persons were capable of drilling a hole of a diameter equal to that bored in any stone in Egypt to which reference has been made. This drill appears to have gone entirely into disuse, though De Boot seems to have possibly referred to such a drill being used about the year 1600.

The moderns possess, it is true, the diamond drill, and also one of steel, two very important advantages over any ancient knowledge in the driller's art, yet to know how to adapt water, steam, or electricity to increasing the rapidity of the revolutions of the drill is more important in the way of accomplishing results than is the possession of the harder cutting materials. Among perforated objects of the ages of stone, an examination will develop the fact that holes through the harder minerals are almost invariably cut by means of tubular ends to the drills, as thereby the cutting away of a great deal of superfluous material is avoided, while in drilling with solid drill shafts the whole contents of the hole has to be ground away.

M. Emile Soldi, an eminent French scholar and himself an engraver of

gems, referring to Flinders Petrie's excavations at Gizeh, speaks of the latter's new theory as to the Egyptians boring stones with tubes having stones harder than quartz set in their rims as well as on the outside and inside of the tubes. This is evidenced by the striæ on the cores and on the sides of the perforations. Soldi refers to M. Perrot having shown that since the Ancient Empire the delta has produced, turned, and drilled vases of the hardest material, and says that none of the Egyptian paintings shows us the statue makers using the drill.

Several English scientists, among others Sir John Evans, showed the insufficiency of Petrie's conclusions. M. Soldi concludes that "nothing beyond tubes of iron or bronze, and water, emery, and patience was necessary."¹

In this view he is undoubtedly correct. Petrie's views were concurred in by the members of the society who were present at the reading of his paper.

Emery powder is found, according to Perot and Chipiez, in unlimited quantities in the Archipelago, and was imported by the Phenicians at a very early date; with such cutting material any stone except the diamond may be perforated with little labor.²

The same authors think that the lathe or a wheel was a comparatively late invention, M. Soldi suggesting that it hardly came into use in Mesopotamia until about the eighth century B. C., but says they must have used the hand drill and bow for centuries.³

The engraved cones and cylinders are almost convincing in their evidence of a knowledge of the drill in Asia and northern Africa since their early prehistoric periods. Mr. Knowles calls attention to the depressions in certain stones from Ireland, which depressions were produced before the bore was commenced.⁴

Notwithstanding the absence, however, of satisfactory proof that the diamond was possessed by the Egyptians, Mr. William St. C. Boscawen asserts that the diamond drill was used among the Babylonians at a very early period and was very likely procured from Egypt.⁵

Flinders Petrie, referring to the drill cores appearing on or in certain Egyptian remains, says they always taper, the cutting stones being set inside and out, of the drill tubes used.⁶

This learned archæologist, who has studied more closely the methods of work of early Egyptian people than has any other Egyptologist, has based his assertions solely upon the appearance of striæ on certain of

¹"Discussion sur le fer en Égypte," Société d'Anthropologie de Paris, January 17, 1884, p. 668.

²Perrot and Chipiez, "A History of Art in Chaldea and Assyria," London, 1884, II, p. 260.

³Ibid., p. 260.

⁴W. J. Knowles, "Port Stewart and other factories in the North of Ireland," Anthropological Institute of Great Britain and Ireland, IX, p. 326.

⁵Journ. Trans. Vic. Inst., XXVI, p. 284.

⁶Anthropological Institute of Great Britain and Ireland, XIII, p. 95.

the cores and the linings of the perforations. It appears to me that this is not sufficient authority to support such a theory, as the work can be performed in a much simpler way. Petrie asserts that no cores under two inches in diameter are found in hard stone. The hollow metallic drill was well known, he says, in Egypt, and he asserts that it was furnished with gems. The absence of these jewels from the tombs he accounts for by attributing to them royal ownership, which would prevent their being buried with the workmen, and thinks that the bronze would be melted up and the jewels reset again and again.¹ This theory is referred to by Sir William Dawson, who appears to rely upon its accuracy.²

Does it not appear singular to European archæologists that the tombs of kings should afford no better returns in such jewels than did those of laborers. The strongest proof, therefore, which is offered that gems were used in drilling stone is, that no such gems are found. It will be shown that the supposed gem striations are simply the marks of the sand which was used in boring, as sand is to-day employed by modern lapidaries in cutting stone. Perrot and Chipiez, in their excellent work entitled "A History of Art in Chaldea and Assyria," assert that "the cutting on the cylinders, or rather on all the engraved stones of western Asia, is in intaglio, which is the earliest form of engraving upon *pietra dura* in every country, the cameo being always a much later production."

The Chaldeans, it is said, naturally began with the softest materials—wood, bone, and shells picked up on the Persian Gulf. Limestone, black, white, and veined marble, and the steatite, of which most of the cylinders are made, were not much more difficult. These substances may be easily cut with a sharp flint, or with metal tools either pointed or chisel shaped. With a little more effort and patience, still harder materials, such as porphyry and basalt, or the ferruginous marbles, serpentine syenite and hematite, could be overcome.³

Yet the authors who have written the history of ancient Egyptian art say nothing could have been easier than to remove the masses of stone between the arms, at the hips, and below the knees of statues by means of the drill. But yet they say that instrument, by which the necessary holes could have been made without dangerous shocks, was certainly unknown to the Egyptians.⁴

This assertion will have to be taken with a certain allowance of doubt, for the Egyptians have been shown to be familiar with the bow drill from a very early period. With a heavier drill, the one worked with thongs, they have been familiar certainly from as early a date as the ancient empire, and from the fourth dynasty to the twenty-fifth or

¹ *Ibid.*, p. 109.

² *Journ. Trans. Vic. Inst.*, xxvi, p. 278.

³ "A History of Art in Chaldea and Assyria," II, p. 258.

⁴ *Op. cit.*, II, p. 311.

later. No hieroglyph has been more common than the drill on their important statues, as will hereafter be shown.

To Mr. Albert Gatschet, of the Bureau of Ethnology, I am indebted for the information that the myth of Prometheus being chained to the Caucasus Mountains for having stolen the fire from the skies, has its foundation in the fact that in "Prometheus" is concealed the word "pramantha," the twirling or turning stick, though really it means the divining rod, from "pra" in advance, and "Mantha" prophesying.

These Sanscrit words are by no means the only indication which we have of the use of a drill in India, for in a collection of marbles in the U. S. National Museum representing the figures used in Indian temples, there is one catalogued "Samudra Mutu," here represented in fig. 177, which, while referring to the implement as a churn (see fig. 137), so clearly embodies the principle of the sacred fire drill of India (see

fig. 134) as to make it a matter of more than passing interest. The apparent connection or similarity of this drill with the Egyptian drill hereafter referred to makes it of double interest, for in the lines from the "Vishnu Purana" put into verse we have Vishnu's advice and its result, which appears to the writer to be fully represented in the figure of the god Samudra Mutu. "Take Mandara, the mountain, for a churning stick, and Vasuki, the serpent, for a rope. I will take care your foes shall share your toil, but not partake in its reward, or drink the immortal draft."

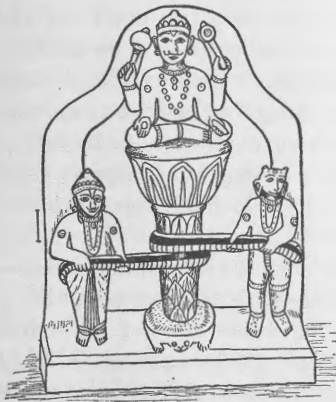


Fig. 177.

INDIAN GOD, SAMUDRA MUTU.

Cat. No. 154875, U. S. N. M.

Then they took the mountain to serve as a churning staff, and next the snake to serve as a cord, and in the ocean's midst Hari himself, present in the tortoise form, became a pivot for the churning staff.

Then, seated on a lotus, beauty's bright goddess, peerless Sri, arose out of the waves.¹

Here we have the shaft and its rope, and one of the most singular analogies between this implement and the Egyptian drill is that the foe shall partake of the toil but shall not participate in its reward. In the figure the demon, or foe, holds one end of the rope, the head, while the human being holds the other end, the tail. The appearance of the lotus is possibly a further link connecting this Indian drill with the Egyptian, as the lotus is always prominent in the latter.

The goddess was Lakshmi, or Sri, the wife of Vishnu, and Hari was one of the incarnations of Vishnu. Sri is seen on the lotus, and Vishnu,

¹"Hindu Mythology," p. 110; W. J. Wilkins, "Puranic Deities," Calcutta, 1882.

in the shape of the tortoise, holds the shaft. Thus in the ocean of milk we see the churn produce a companion to the god.

The most critical scrutiny of the glyphs of Egypt will convince anyone that while early Egyptian artists may have been deficient in the knowledge of perspective, they were most accurate in delineating the human figure. Not only was this the case, but their drawing was very true to nature. Wherever a human figure is represented, it will be seen that the pose is as natural as any that could be drawn to-day, and that accuracy of detail has been studied with as great care as could be exercised at present.

While the writer was making experiments with drills at the U. S. National Museum, and when he had somewhat familiarized himself with the principles upon which drills worked, and had used the drill as represented in fig. 143, he was struck by the peculiarity of pose of the so-called Nile gods represented on the base of the seated colossal statues, one of which is known as the Vocal Memnon.

One of the most striking peculiarities of the figures, which in works on Egyptology are invariably referred to as Nile gods, is the almost universal habit of representing upon these gods the breasts of women.

A second and greater peculiarity than the question of sex is, that these gods who are supposed to be worshiping a dual deity representing the upper and lower Nile, combined under a single Pharaoh, are always represented in the pose of work people. Ropes are in the hands of each, and their feet are set to brace themselves in pulling the ropes, as anyone can see. The instrument between these figures, which appears to the writer a drill, is spoken of among Egyptologists as the "Sam" or "S's'm," and at times is referred to as an altar.

The writer has endeavored to collect all the representations that could be found in works on Egyptian monuments representing in any way the "Sam," and they are mostly illustrated in this communication. The inference drawn is that the implement is a drill which works upon a very simple principle, as seen in fig. 177, and is quite easy to manipulate.

It was no uncommon thing if the Egyptians wished to represent a water scene, to fill the whole of what we would show as background full of fishes swimming as though against a wall. If a canal was to be pictured, or a trough among the trees, we see the trees plainly enough, and the trough or canal equally as distinctly, but convention has dictated that the canal crosses the trees about half way up the tree trunks, as though it were held up on its side by an invisible support—a decided violation of the laws of perspective.

The "Sam" is conventionalized, especially on furniture, and is most common on the sides of chairs; its conventionalism is carried at times to an extreme point, yet all the instances are here given which have come under the writer's notice, in order that those better able to judge may form an opinion as to the correctness of his views on this subject.

Fig. 178, from the base of an ottoman, represents this implement in its most conventional shape. Yet the writer will show that in this figure a complete drill is represented. The figure is an enlargement of a small illustration from "Pharaoh's Fellahs and Explorers."¹

There are certain hieroglyphs which almost always accompany these pictographs that are evidently representations of the parts of the machine and of its work, and appear to be ideographic, which, however, it is impossible to go into in this paper.

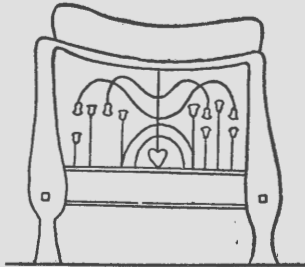


Fig. 178.

CONVENTIONAL DISK DRILL.
From a figure by Miss Amelia B. Edwards.

On the bases of the seats of Egyptian chairs these so-called "Sam" appear, but these chair bases are as frequently ornamented with representations of bound slaves, as we see on the ottoman of Rameses III, represented in fig. 179.

Here the enemy appears in one panel and

what is apparently intended for a bow is in another.²

Referring to decorations, Prof. G. Masperó says, "Elsewhere we find those emblematic plants which symbolize the union of upper and lower Egypt under the rule of a single Pharaoh, or kneeling figures tied to the stake in couples, each couple consisting of an Asiatic and a negro."³ (Fig. 180.) The figure appears simply that of a slave or prisoner bound to a stake, and may be classed as an ornament.

In fig. 181 we again find the negro and Asiatic tied back to back; and the stake in this figure takes form, for it may no longer be taken for a stake. Here we present the "Sam," as it is called, in the upright column, with the disk at the top. The ropes tying the slaves pass gracefully over their heads and hang down in front, one having an end of the lotus and the other of the papyrus. The brace of this tool starts out from the center of the drill, near the elbows of the slaves, and enters the ground, one side being seen between the feet of the African. The figure is accompanied by a memorandum that it is taken from the tomb of Schampthe (Thebes), under Amenophis III, about the sixteenth century S. C. Here,

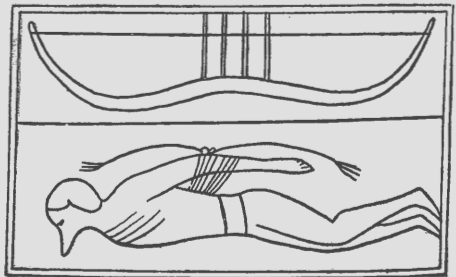


Fig. 179.

REPRESENTATION OF PRISONER AND BOW ON OTTOMAN.
From a figure in Wilkinson's "Ancient Egyptians."

¹ Amelia B. Edwards, "Pharaoh's Fellahs and Explorers," New York, 1892, p. 125.

² Sir J. H. Gardner Wilkinson, "The Ancient Egyptians," 1854, I, p. 67.

³ G. Masperó, "Egyptian Archaeology," New York, 1889, p. 88, fig. 98.

also, we see the peculiar figure at the base of the shaft, which almost invariably accompanies representations of this figure of the "Sam."¹

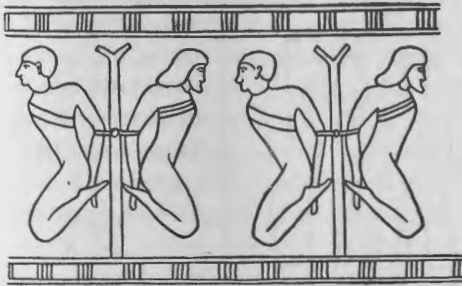


Fig. 180.

BOUND SLAVES ON BASE OF OTTOMAN OF RAMESES III.

From a figure in Maspero's "Egyptian Archeology."

These prisoners, so tied, are not invariably a single pair, but at times we find six or more, as in fig. 182, which illustrates the conventionalized form of the tool; five of these figures are tied to the "Sam," the sixth being tied by himself. The King (Amenophis IV) and his family of three children are on a stand, apparently throwing golden collars to the people, while on the base of the stand the slaves are tied to this conventionalized drill.²

If we admit that the work was performed with this tool, whatever it was, we must admit that none were more apt to be assigned to the work than slaves or prisoners taken in battle. The position in which these figures are usually found, upon the bottom of chairs as supports, would not be calculated to convey any evidence of worship, but rather of servitude.

Fig. 183 shows a fragment of the base of a statue of the twelfth dynasty; the base of the drill, if it be a drill, is seldom left out. The stem of the drill, with the disk on the top of the shaft, as the Chinese work the pump drill, are both here; finally, the two strings with which the drill was worked are present. These straps or ropes, as they must

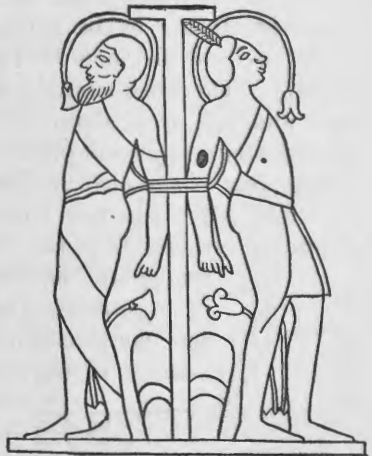


Fig. 181.

PRISONERS TIED BACK TO BACK ON EGYPTIAN DISK DRILL.

From a figure in Nott and Gliddon's "Indigenous Races of the Earth."

¹J. C. Nott and George R. Gliddon, "Indigenous Races of the Earth," Philadelphia, 1857, p. 189, fig. 88.

²"Life in Ancient Egypt and Assyria," from the French of G. Maspero. New York, 1892, pl. 115, fig. 70.

have been, are almost invariably represented with one terminating with the flower of the papyrus and the other with that of the lotus.¹

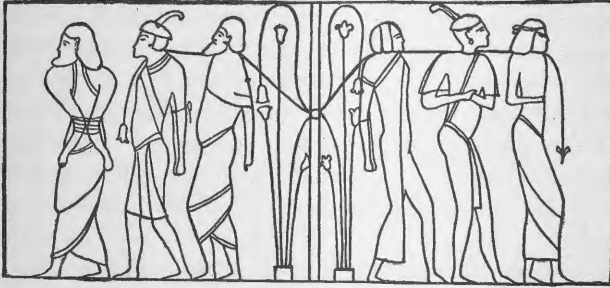


Fig. 182.

SIX PRISONERS TIED TO DISK DRILL.

From a figure in Maspero's "Egyptian Archeology."

of the drill, including the shaft, head disk, and strings. The base of the drill is double. This figure is from Sakkarah, and is in the Abbott collection of Egyptian antiquities.

Fig. 185 is taken from the base of a statue of Hathor in the Royal Museum of Berlin, and belongs to the twelfth dynasty. The lines running out to the right and left, from about the center of the drill stock, represent probably a brace for the stem of the drill as it is revolved right and left. The two flower-pot-like objects on either side of the base are intended in some way to aid in tightening the braces; the particulars of the manner of working, however, do not distinctly appear.²

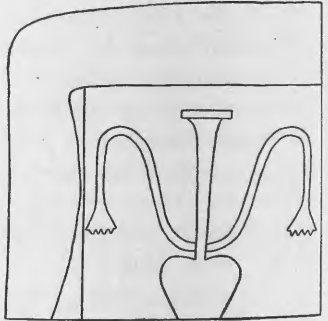


Fig. 183.

DISK DRILL ON BASE OF STATUE.

Twelfth dynasty.

From a figure by Lepsius.

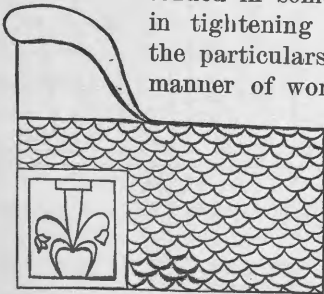


Fig. 184.

DISK DRILL ON BASE OF STATUE OF OSIRIS.

Abbott collection of Egyptian antiquities.

drill has across its center the usual brace, but across both stem and brace there appears what is evidently intended for a knot, showing

¹ C. R. Lepsius. "Denkmäler aus Ägypten und Äthiopen," iv, part II, pl. 118.

² Ibid., pl. 120.

that the cord was tied and not wrapped on the shaft. The second difference has possibly little significance, it being in the marks which cross the stem of the drill, intending probably to represent the revolving motion of the implement. The figure here given shows what we may designate as the conventionalized drill, where we have strings, shaft, base, and brace.

Were this figure the sole one, we could not suggest an explanation of the im-

plement to be here represented; but, taken with the other examples illustrated in this article, there remains but little doubt that this is a drill.

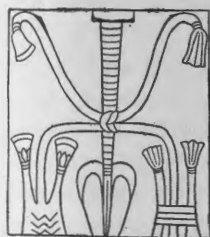


Fig. 186.

DISK DRILL ON BASE OF STATUE OF CHEPHREN.

From a cast in the U. S. National Museum.

which are here given, or which the writer has seen. The knot on the brace and stem seems to indicate that the brace and ropes are one.

The drawings always agree with each other. This figure represents a "sort of altar ornamented with lotuses twined around each other, upon which are often laid the offerings shown in pictures of decoration."²

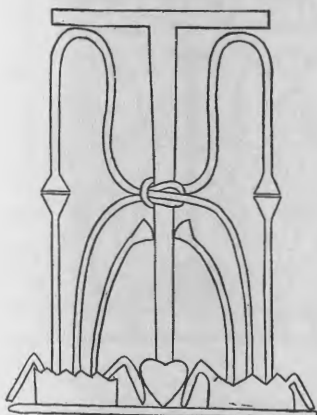


Fig. 188.

DISK DRILL FROM LATEOPOLIS.

From "Description de l'Égypte."

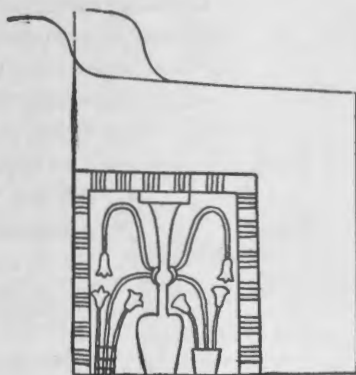


Fig. 185.

DISK DRILL ON BASE OF STATUE OF HATHOR.

From a figure by Lepsius.

The figure is taken from the base of a black granite seated statue at Karnak (Thebes) of the cat god (fig. 187).¹

Fig. 188 shows the drill shaft more fully, as well as more clearly, than do any of the other figures

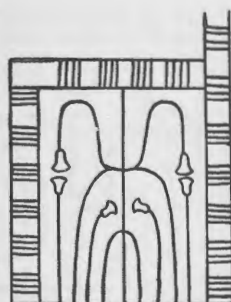


Fig. 187.

DISK DRILL ON BASE OF STATUE OF CAT GOD.

Thebes.

From "Description de l'Égypte."

Fig. 189 is a representation of the chair of Rameses III, as it is painted on his tomb, and again shows the drill in a purely conventional manner. Yet the utilitarian part of the imple-

¹ "Description de l'Égypte," Paris, 1826, III, pl. 48, fig. 7.

² *Ibid.*, I, pl. 80.

ment is not lost sight of, as it all appears on the chair to the smallest detail.¹



Fig. 189.

CONVENTIONALIZED DISK DRILL
ON CHAIR OF RAMESES II.

From a figure in Wilkinson's "Ancient
Egyptians"

Examine carefully fig. 190, in which we see again the "Sam" complete, accompanied by two kneeling figures of women holding the ropes with which the machine is worked, looped in their hands, while they rest preparatory to continuing their work. This figure is from San, and of the thirteenth dynasty.²

There are two cartouches upon this figure; the one to the left contains four of what appear to be the hieroglyphs usually accompanying these instruments—three at the bottom of the cartouche and the fourth immediately above them.

In fig. 191 the two women are seen standing at rest; and here again they are evidently prepared to recommence work. The plant-like stems coming from near the women's feet are being drawn upon, as though in some way they were intended to tighten the brace. The working rope is held up as if to prevent its tangling in wrapping it

on the shaft of the drill as the work is started. It looks as though the straps might in some way be used to put the drill in motion, yet if so, the writer can not explain it.



Fig. 190.

DISK DRILL.

Thirteenth dynasty.

From a figure by Petrie.

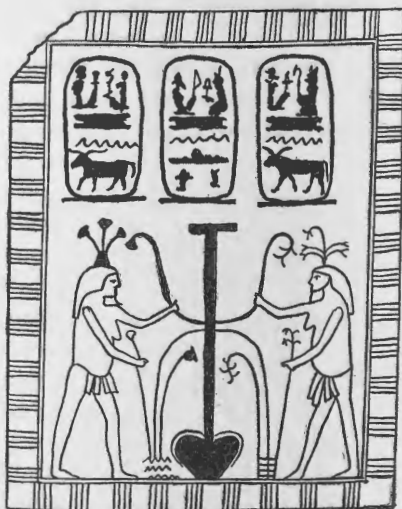


Fig. 191.

DISK DRILL.

Sixth to Twelfth dynasty.

From a figure by Petrie.

There are three cartouches upon this glyph, which is attributed to San and to belong to the sixth to the twelfth dynasty.³

¹ Sir J. H. Gardner Wilkinson, "A Popular Account of the Ancient Egyptians," New York, XI, p. 61.

² Petrie, "Tanis," Part I, 1883-84, Second Memoir of the Egypt Exploration Fund (London, 1885), pl. III.

³ *Ibid.*, pl. I.

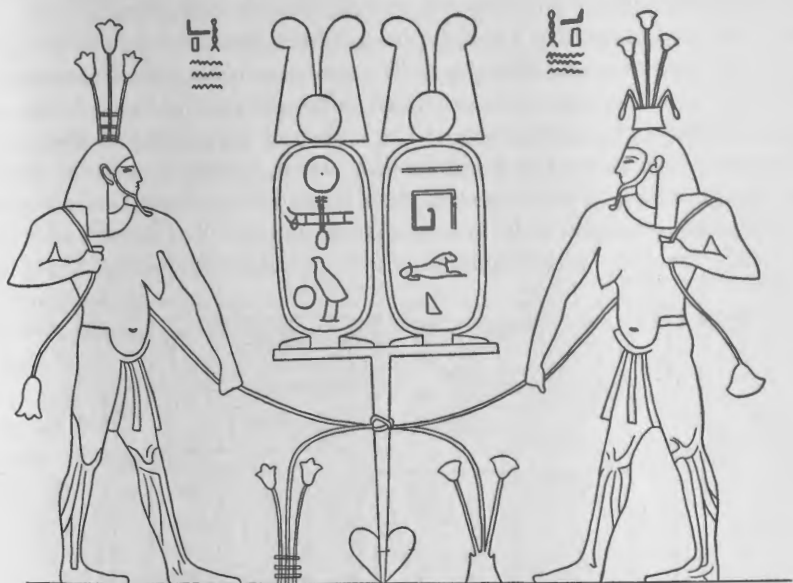


Fig. 192.

ETHIOPIAN DISK DRILL.
Twenty-fifth dynasty.

From a figure by Lepsius.

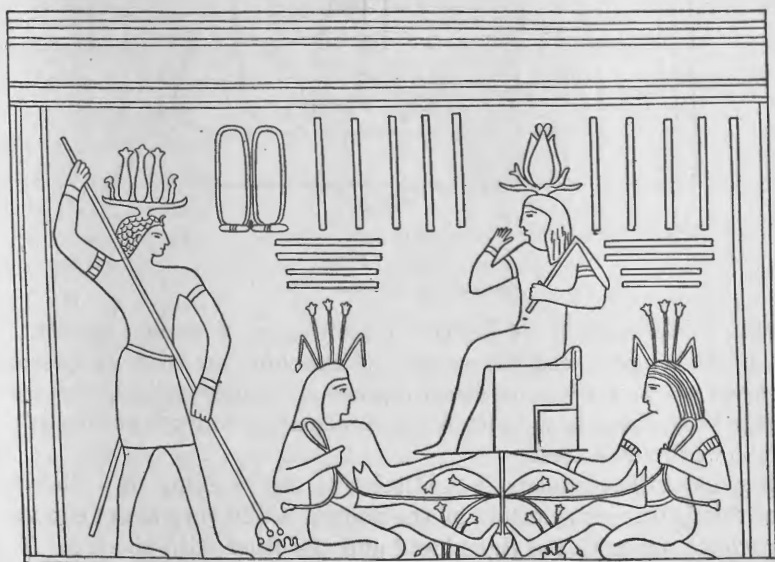


Fig. 193.

DISK DRILL.
Koum Ombos.

In fig. 192 we have what is referred to as an altar in the great temple, and is said to belong to the twenty-fifth Ethiopian dynasty. On three sides of this glyph are hieroglyphs not here represented. The women are standing at rest, with the drill cords drawn back over their shoulders. Upon the "Sam" rest two cartouches, the one to the left containing apparently the ideograph of the stem and heart-like foot piece of its base or point, as well as a ladder-like object, having a loop on one of its rungs, which is at times seen with these drills. Near the top of the cartouches, on either side, are seen small hieroglyphs, in each of which appears the rope which commonly accompanies representations of the

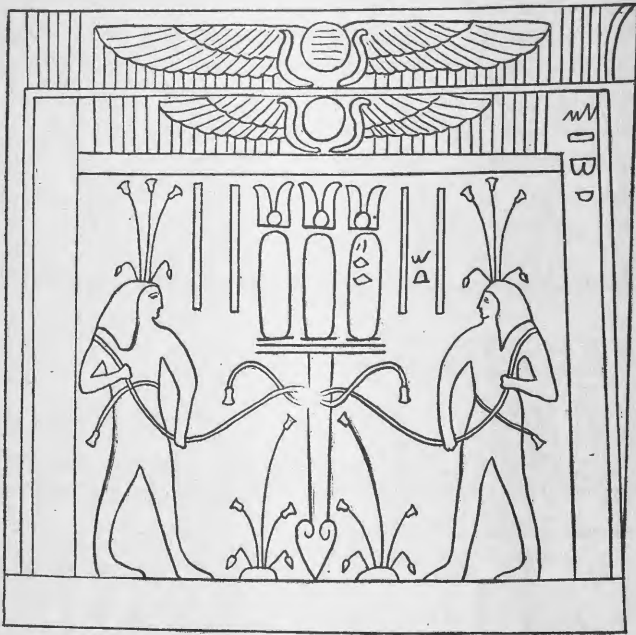


Fig. 194.

DISK DRILL.

Island of Philæ.

From a figure in "Description de l'Égypte."

"Sam." Here again we see the graceful pose of women at rest. On the brace is again seen the manner of attaching the cord, as was noted in figs. 186 and 188.¹ If these figures are emblematical, one would surely be inclined to say they were emblematical of work performed and of the workmen at rest.

Fig. 193 will convince one familiar with the working of a disk drill that this is a representation of the women in the very act of commencing work; one with the right hand and the other with the left. They are about to set the drill in motion, having their feet braced and the

¹ C. R. Lepsius, "Denkmäler aus Ägypten und Äthiopen," x, part 5, pl. 13, fig. 6.

cord loosely held, ready to take up the work as soon as the cord is sufficiently drawn to give the necessary impetus to the machine.

Fig. 194 is unique in that the supposed brace is absent, and also that we see both ends of the drill rope. Here again are seen the laborers resting at ease, with drill ropes passing over their shoulders and around their bodies in graceful curves. The ropes are doubled around the shaft. Above the disk there are three cartouches. This figure is taken from the face of a little monolith in the portico of the grand temple of the island of Philæ. It is of granite and said to be worked out with

skill; it is represented as being "badly smoked, which prevents the hieroglyphs being distinguished."¹

One writer says, "the sides of the thrones are ornamented with hieroglyphs, by which the dominion of the sovereigns over upper and lower Egypt is supposed to be typified by figures of the god Nilus binding the stalks of two water-plants around the support of a tubular frame or stellæ that contains the ovals and characters which probably record the action of those colossi." He is speaking of "statues of

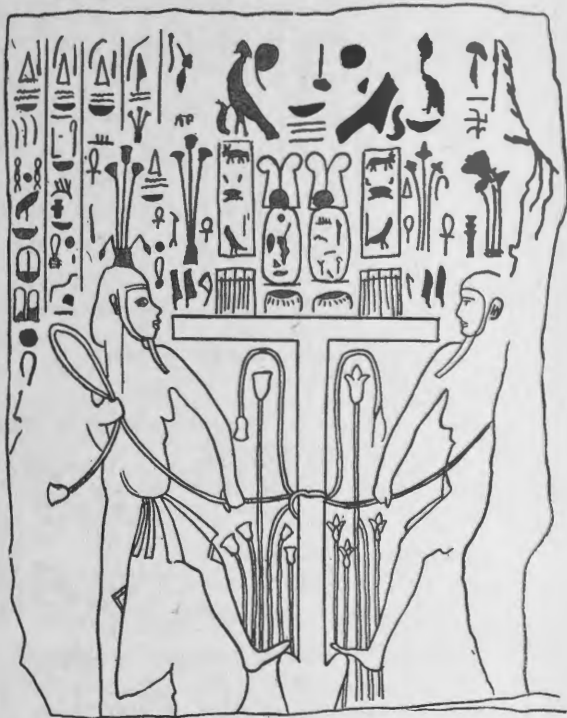


Fig. 195.

DISK DRILL ON STATUE OF MEMNON.

From a figure in Stevens' "Travels in Central America and Yucatan."

Memnon," in the plains of Goormah, at Thebes. The nearest one is ascertained to be Amenophis III, believed to be the Pharaoh of the Exodus, 1500 B. C. The author says this statue may have been seen by Moses.²

These statues are said to have been originally 60 feet in height. They have now about 13 feet of their bases covered with the accumulations of the centuries which have passed since they were made.

Fig. 195 is taken apparently from one of the statues here represented, Stevens referring to it as being "introduced as a plate of Egyptian

¹ "Description de l'Égypte," Paris, 1826, I, p. 10.

² Quar. Journ. Geol. Soc. London, 1846, I.

sculpture from Mr. Catherwood's portfolio, being from the side of the great monument at Thebes, known as the Vocal Memnon," which at the time of the publication of Stevens's book had never before "been engraved."¹

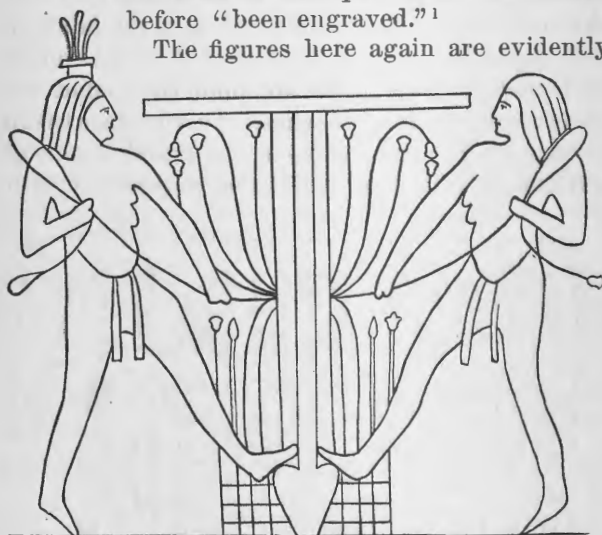


Fig. 196.

DISK DRILL ON SOUTHERN STATUE OF MEMNON.

From a figure in "Description de l'Égypte."

one of the workmen or women would be near to the shaft, while the other was at the greatest distance from it. Again, the position here represented is such as to enable two persons working the drill to accomplish the most work with greatest ease to themselves.

Fig. 196 is represented as containing the details of the Southern Colossus of Memnon, at Thebes, being a profile of the Colossus of the South. It is a picture which ornaments the chair of the Colossus, which is carefully copied.² The details of this figure and the preceding one are somewhat similar, yet the writer finds so many discrep-

the act of working the drill, their hands being equidistant from the shaft, as shown in all drawings of this machine, which indicates that the ropes by which it is worked should be tied to the shaft, for were it manipulated as the strap drill usually is among the Eskimo, by merely wrapping it on the staff, the hands of



Fig. 197.

DISK DRILL ON BASE OF STATUE OF AMENNEMHAT.

Twelfth dynasty.

From a figure by Petrie.

¹John L. Stevens, "Travels in Central America and Yucatan," New York, 1841, II, p. 442.

²"Description de l'Égypte," II, pl. 21, fig. 2.

ancies between representations of the same glyphs that certainty can never be felt as to what details have been changed in any given instance, and as both of these Theban statues appear to have had representations upon their bases, it may be that these two figures are from two statues.

Fig. 197 appears on the base of a colossal statue, in black granite, to Amennemhat, successor to Usertesen. "The sides of the throne bore the old group of the two Niles holding the lotus and papyrus twisted on the 'Sam.'" Twelfth dynasty. "The stems of the lotus and papyrus are shown twisted around the 'Sam' on throne of Khabra in the fourth dynasty."¹

The picture represents persons actively at work, there being much spirit shown in the drawing of the figures. The same characteristics in the position of the persons at work again appears in fig. 198, upon which are seen a number of hieroglyphs. The representation is marked "Nebeshet." There is no very particular description of this example in the volume from which the figure is taken. Across the bottom of the glyph are represented flying birds.²



Fig. 198.

DISK DRILL FROM NEBESHET.

From a figure by Petrie.

Fig. 199 represents the same figures on a statue of Usertesen I (twelfth dynasty), and although not as distinct as might be desired, represents work being actively performed by means of the ropes in the hands of the persons, and is quite similar to figs. 197 and 198.³ Although we here again clearly have the figures of women at work, they are referred to as Nile gods.

After thoroughly comparing the illustrations of the Egyptian drills one with the other, an effort was made to construct the implement and to work it (see fig. 143). This form of drill may as well be called a top drill as anything else, as it appears to embody the principle of the Egyptian drill in its most primitive shape; yet if we examine the pump drill (fig. 171), we observe that the same thing—namely, the disk—is that which causes the shaft to continue its revolutions alternately to the

¹ Petrie, "Tanis," part i, 1883-84, Second Memoir of the Egypt Exploration Fund (London, 1885), pl. II.

² *Ibid.*, part 2, pl. 9.

³ Petrie, "Bubastis," 1887-89, Memoirs of the Egypt Exploration Fund (London, 1889-90), pl. 24, fig. D.

right and left. This alternate movement in the pump drill is caused by the strings winding and unwinding as they are released or drawn tight. If the Chinese pump drill (fig. 174) is scrutinized, the disk is found at the top of the shaft, and all that would be necessary to make of it an Egyptian drill would be to provide a brace to steady the motion of the shaft and to tie the string near the brace instead of on top. There seems no difference in these drills, and it may be fairly argued that the pump drill is the descendant of its Egyptian parent.

An analysis of the Egyptian drill suggests that the shaft works freely at the brace, and that the hands are near and far from the shaft, while working in unison, and not alternately. The heart-shaped point of the shaft appears to be its guide; the flowers in the flowerpot and the

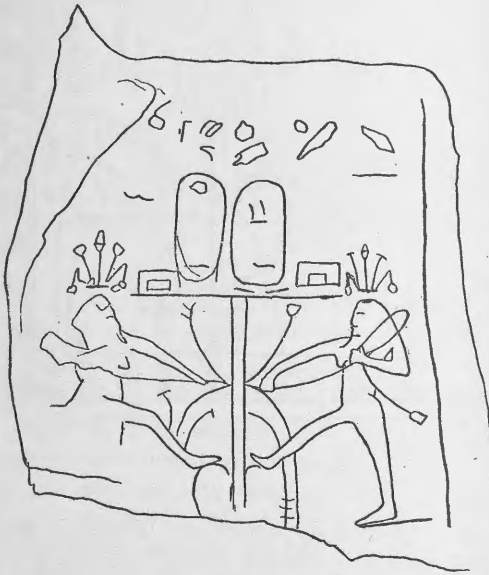


Fig. 199.

DISK DRILL ON STATUE OF USERTESEN.

Twelfth dynasty.

objects shaped like a grating at the feet of the women in fig. 191 would suggest that the plant by being tightened had some action upon the drill, though the writer has not been able to solve the question satisfactorily to himself. Therefore an effort was made to construct a working model, which was done, as is shown in fig. 200. First, the bottom of the framework was made, with a hole in its center to act as a guide to the drill point, through which it ran, and to steady the shaft at the same time. This not acting satisfactorily, a second brace for the shaft was tacked on above the

first, which caused the shaft to revolve with perfect ease and without play at the point. So perfectly does this act that the writer has become convinced that the heart-shaped point at the lower end of the shaft is necessarily a guide, which, in connection with the brace above it, causes such easy revolutions that one can hardly imagine the tool being used without both brace and guide. The rest of the drill was simple. For a shaft a broomstick answered very well, while a piece of water pipe served for a tube on its end. The disk of wood being wedged to the shaft, all that was necessary to complete the implement was its rope. Winding a bedcord around the shaft as the cord is wound around a strap drill, it was found that alternate pulling drew the shaft to one side or the other, causing it to bind and prevent the shaft

from turning freely. As soon, however, as the cord was firmly tied to the shaft and wound, as is done on the shaft of a strap drill, and then pulled regularly, the shaft revolved with the exactness of a pump drill, and was easily run at the rate of 275 revolutions or more per minute. It will be found that the ends of the lower board of the framework will instinctively be used by a person working this drill for a foot brace, as is done in fig. 196, which gives one an immense advantage over a person with both feet at the same level on the ground. As one of the illustrations (not here given) shows the feet of the work people on a brace, such as represented in fig. 201, which ran directly from the flower-

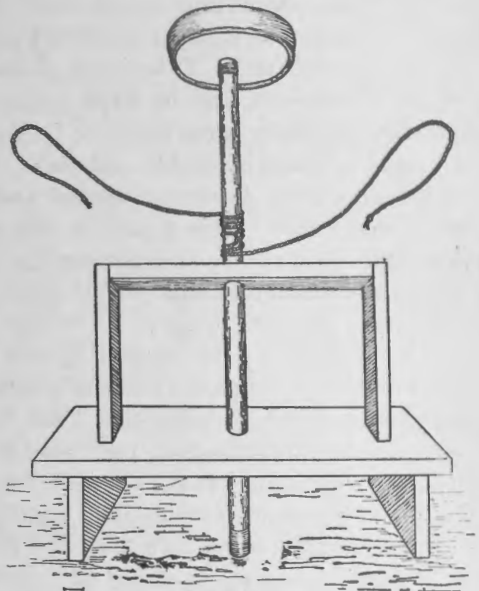


Fig. 200.

EXPERIMENTAL DISK DRILL.

pot brace to a ring on the shaft, the drill was built accordingly, and on the shaft a shoulder was tacked to keep the ring from falling. The brace in this instance was tied to a nail in the side of the frame to keep the brace cord tight. The drill worked as well as that represented in the preceding figure, but the string would at times become slack from the jar, and needed retightening.

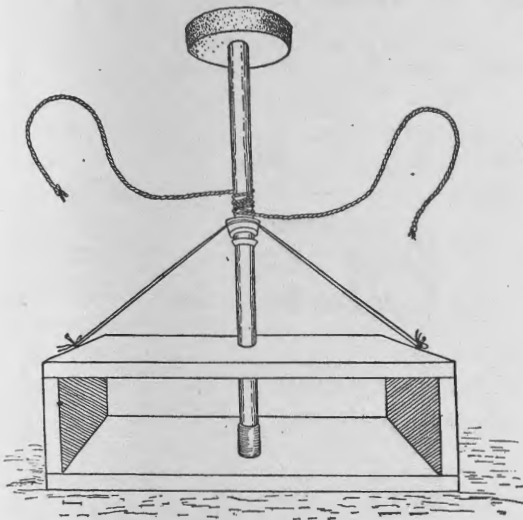


Fig. 201.

EXPERIMENTAL DISK DRILL.

The stone upon which the test was made was a block of catlinite an inch and a quarter thick. First, the drill shown in fig. 200 was worked, with the end of a pipe for a boring tube; with quartz

sand it cut with entire satisfaction, though the thickness of the pipe was too great for the drill to do good work; consequently when the hole

had been bored slightly over a fourth of an inch a thin tube of mercantile copper was substituted, which, with the sand, made an ideal tool for boring stone, and would to-day bore a hole with absolute precision through the hardest mineral were emery sand used instead of ordinary quartz sand. The motion of this drill is easy to the workman, and the implement may be kept going with slight fatigue. Were it necessary, as many cords could be tied to the shafts as there was room for people to stand around it and pull.

A distinguished American savant and Egyptologist has suggested that if this "Sam" were a tool, it was one intended for digging purposes, and could not be used for boring.

Every illustration of this "Sam" which has come under the writer's observation answers in all its parts to a drill. The implement is similar to a pump drill; the human figures are those of women, and are almost invariably upon the bases of statues. Bound prisoners are commonly represented as being tied back to back to the implements, and they are generally of another race than the Egyptians. For these reasons the writer claims that the "Sam" is not an altar, that the people standing at it are not worshipping, that the so-called gods are goddesses of work, that the "Sam" is a tool, and that figs. 200 and 201 represent the implement, and fig. 42 shows all the characteristics of the drill cores of Egyptian bored stones. The slaves were placed under their masters' seats, were tied, and we may imagine that, as Vishnu said, "their enemies should perform the work but should not participate in the fruits of their labor."

THE SWASTIKA,

THE EARLIEST KNOWN SYMBOL, AND ITS MIGRATIONS; WITH OBSERVATIONS
ON THE MIGRATION OF CERTAIN INDUSTRIES IN PREHISTORIC TIMES.

BY

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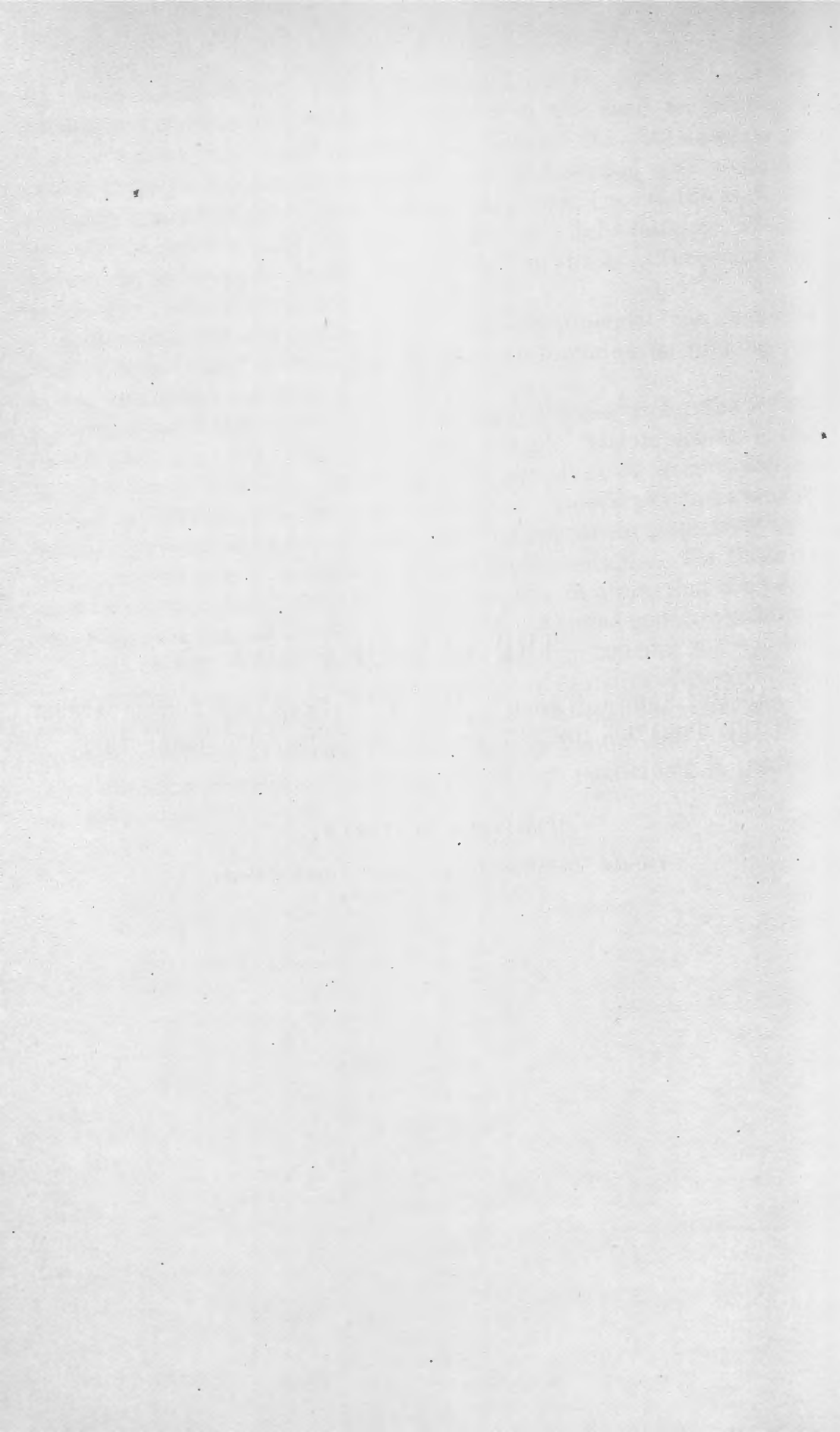


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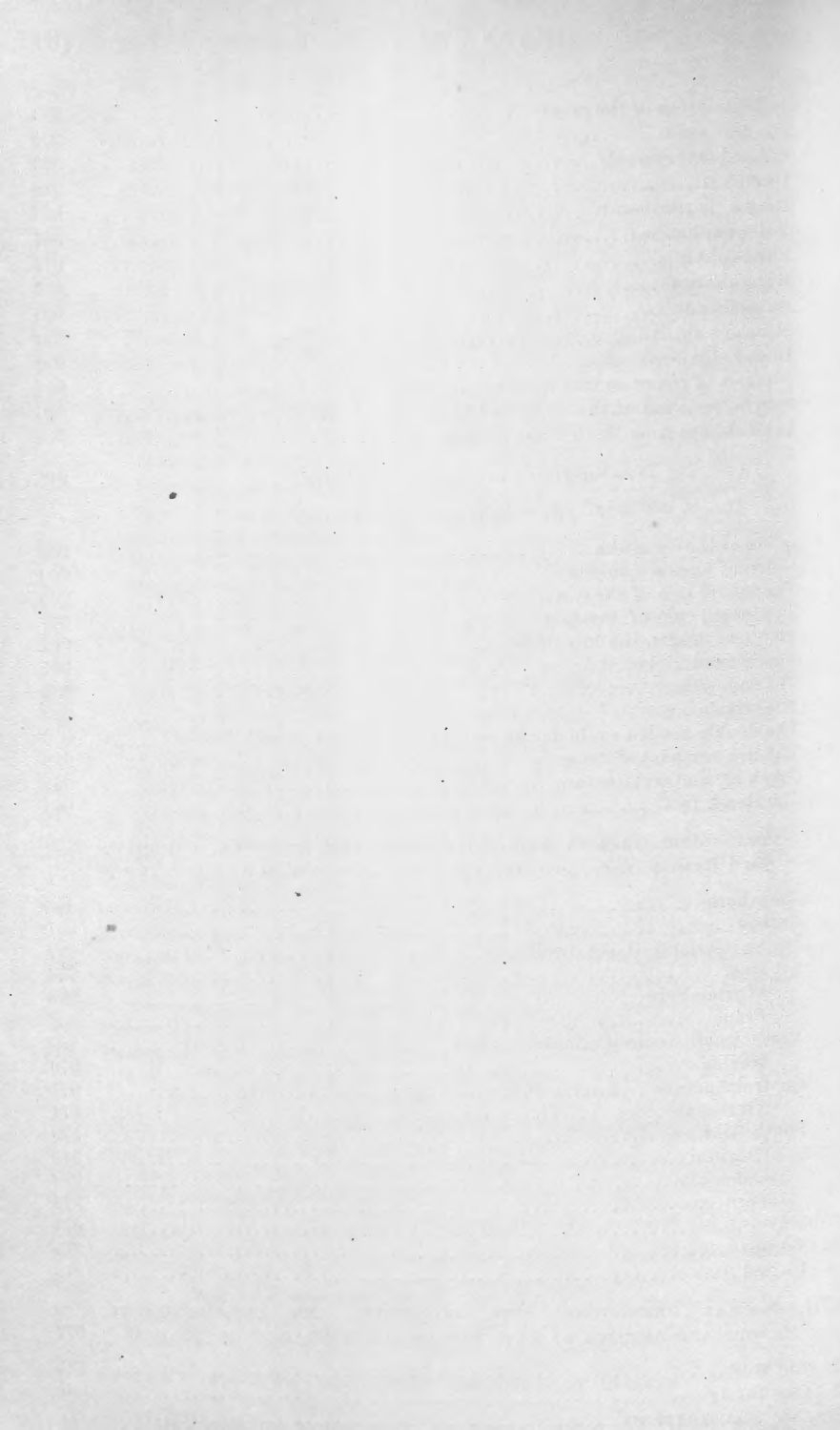
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THE SWASTIKA,

THE EARLIEST KNOWN SYMBOL, AND ITS MIGRATIONS; WITH OBSERVATIONS ON THE
MIGRATION OF CERTAIN INDUSTRIES IN PREHISTORIC TIMES.



By THOMAS WILSON,

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PREFACE.

An English gentleman, versed in prehistoric archæology, visited me in the summer of 1894, and during our conversation asked if we had the Swastika in America. I answered, "Yes," and showed him two or three specimens of it. He demanded if we had any literature on the subject. I cited him De Mortillet, De Morgan, and Zmigrodzki, and he said, "No, I mean English or American." I began a search which proved almost futile, as even the word Swastika did not appear in such works as Worcester's or Webster's dictionaries, the Encyclopædic Dictionary, the Encyclopædia Britannica, Johnson's Universal Cyclopædia, the People's Cyclopædia, nor Smith's Dictionary of Greek and Roman Antiquities, his Greek and Roman Biography and Mythology, or his Classical Dictionary. I also searched, with the same results, Mollett's Dictionary of Art and Archæology, Fairholt's Dictionary of Terms in Art, "L'Art Gothique," by Gonza, Perrot and Chipiez's extensive histories of Art. in Egypt, in Chaldea and Assyria, and in Phenicia; also "The Cross, Ancient and Modern," by W. W. Blake, "The History of the Cross," by John Ashton; and a reprint of a Dutch work by Wildener. In the American Encyclopædia the description is erroneous, while all the Century Dictionary says is, "Same as fylfot," and "Compare *Crux Ansata* and *Gammadion*." I thereupon concluded that this would be a good subject for presentation to the Smithsonian Institution for "diffusion of knowledge among men."

The principal object of this paper has been to gather and put in a compact form such information as is obtainable concerning the Swastika, leaving to others the task of adjustment of these facts and their

arrangement into an harmonious theory. The only conclusion sought to be deduced from the facts stated is as to the possible migration in prehistoric times of the Swastika and similar objects.

No conclusion is attempted as to the time or place of origin, or the primitive meaning of the Swastika, because these are considered to be lost in antiquity. The straight line, the circle, the cross, the triangle, are simple forms, easily made, and might have been invented and re-invented in every age of primitive man and in every quarter of the globe, each time being an independent invention, meaning much or little, meaning different things among different peoples or at different times among the same people; or they may have had no settled or definite meaning. But the Swastika was probably the first to be made with a definite intention and a continuous or consecutive meaning, the knowledge of which passed from person to person, from tribe to tribe, from people to people, and from nation to nation, until, with possibly changed meanings, it has finally circled the globe.

There are many disputable questions broached in this paper. The author is aware of the differences of opinion thereon among learned men, and he has not attempted to dispose of these questions in the few sentences employed in their announcement. He has been conservative and has sought to avoid dogmatic decisions of controverted questions. The antiquity of man, the locality of his origin, the time of his dispersion and the course of his migration, the origin of bronze and the course of its migration, all of which may be more or less involved in a discussion of the Swastika, are questions not to be settled by the dogmatic assertions of any individual.

Much of the information in this paper is original, and relates to prehistoric more than to modern times, and extends to nearly all the countries of the globe. It is evident that the author must depend on other discoverers; therefore, all books, travels, writers, and students have been laid under contribution without scruple. Due acknowledgment is hereby made for all quotations of text or figures wherever they occur.

Quotations have been freely made, instead of sifting the evidence and giving the substance. The justification is that there has never been any sufficient marshaling of the evidence on the subject, and that the former deductions have been inconclusive; therefore, quotations of authors are given in their own words, to the end that the philosophers who propose to deal with the origin, meaning, and cause of migration of the Swastika will have all the evidence before them.

Assumptions may appear as to antiquity, origin, and migration of the Swastika, but it is explained that many times these only reflect the opinion of the writers who are quoted, or are put forth as working hypotheses.

The indulgence of the reader is asked, and it is hoped that he will endeavor to harmonize conflicting statements upon these disputed questions rather than antagonize them.

I.—DEFINITIONS, DESCRIPTION, AND ORIGIN.

DIFFERENT FORMS OF THE CROSS.

The simple cross made with two sticks or marks belongs to prehistoric times. Its first appearance among men is lost in antiquity. One may theorize as to its origin, but there is no historical identification of it either in epoch or by country or people. The sign is itself so simple that it might have originated among any people, however primitive, and in any age, however remote. The meaning given to the earliest cross is equally unknown. Everything concerning its beginning is in the realm of speculation. But a differentiation grew up in early times among nations by which certain forms of the cross have been known under certain names and with specific significations. Some of these, such as the Maltese cross, are historic and can be well identified.

The principal forms of the cross, known as symbols or ornaments, can be reduced to a few classes, though when combined with heraldry its use extends to 385 varieties.¹



Fig. 1.

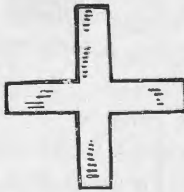
LATIN CROSS (*Cruz immissa*).

Fig. 2.

GREEK CROSS.



Fig. 3.

ST. ANDREW'S CROSS (*Cruz decussata*).

It is not the purpose of this paper to give a history of the cross, but the principal forms are shown by way of introduction to a study of the Swastika.

The Latin cross, *Cruz immissa*, (fig. 1) is found on coins, medals, and ornaments anterior to the Christian era. It was on this cross that Christ is said to have been crucified, and thus it became accepted as the Christian cross.

The Greek cross (fig. 2) with arms of equal length crossing at right angles, is found on Assyrian and Persian monuments and tablets, Greek coins and statues.

The St. Andrew's cross, *Cruz decussata*, (fig. 3) is the same as the Greek cross, but turned to stand on two legs.

¹William Berry, *Encyclopædia Heraldica*, 1828-1840.

The *Crux ansata* (fig. 4) according to Egyptian mythology, was Ankh, the emblem of Ka, the spiritual double of man. It was also said to indicate a union of Osiris and Isis. and was regarded as a symbol of the generative principle of nature.



Fig. 4.

EGYPTIAN CROSS
(*Crux ansata*).
The Key of Life.

The Tau cross (fig. 5), so called from its resemblance to the Greek letter of that name, is of uncertain, though ancient, origin. In Scandinavian mythology it passed under the name of "Thor's hammer," being therein confounded with the Śwastika. It was also called St. Anthony's cross for the Egyptian hermit of that name, and was always colored blue. Clarkson says this mark was received by the Mithracists on their foreheads at the time of their initiation. C. W. King, in his work entitled "Early Christian Numismatics" (p. 214), expresses the opinion that the Tau cross was placed on the foreheads of men who cry after abominations. (Ezekiel ix, 4.) It is spoken of as a phallic emblem.

Another variety of the cross appeared about the second century, composed of a union of the St. Andrew's cross and the letter P (fig. 6), being the first two letters of the Greek word $\chi\rho\iota\sigma\tau\acute{o}\varsigma$ (Christus). This, with another variety containing all the foregoing letters, passed as the monogram of Christ (fig. 6).

As an instrument of execution, the cross, besides being the intersection of two beams with four projecting arms, was frequently of compound forms as Υ , on which the convicted person was fastened by the feet and hung head downward. Another form Γ , whereon he was

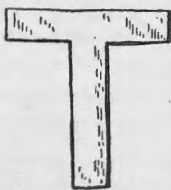


Fig. 5.

TAU CROSS, THOR'S HAMMER,
OR ST. ANTHONY'S CROSS.

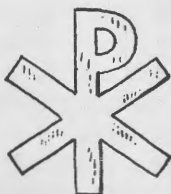


Fig. 6.

MONOGRAM OF CHRIST.
Labarum of Constantine.

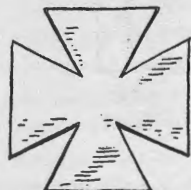


Fig. 7.

MALTESE CROSS.

fastened by one foot and one hand at each upper corner; still another form Γ , whereon his body was suspended on the central upright with his arms outstretched upon the cross beams.

Fig. 7 represents the sign of the military order of the Knights of Malta. It is of medieval origin.

Fig. 8 (a and b) represents two styles of Celtic crosses. These belong chiefly to Ireland and Scotland, are usually of stone, and frequently set up at marked places on the road side.

Higgins, in his "Anacalypsis," a rare and costly work, almost an encyclopedia of knowledge,¹ says, concerning the origin of the cross, that the official name of the governor of Tibet, Lama, comes from the ancient Tibetan word for the cross. The original spelling was L-a-m-h. This is cited with approval in Davenport's "Aphrodisiacs" (p. 13).

Of the many forms of the cross, the Swastika is the most ancient. Despite the theories and speculations of students, its origin is unknown. It began before history, and is properly classed as prehistoric. Its description is as follows: The bars of the normal Swastika (frontispiece and fig. 9) are straight, of equal thickness throughout, and cross each other at

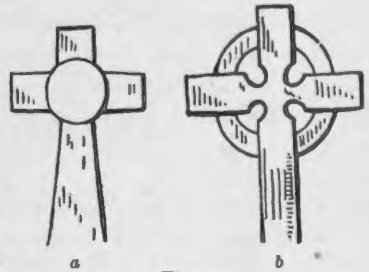


Fig. 8.

• CELTIC CROSSES.



Fig. 9.

NORMAL SWASTIKA.



Fig. 10.

SUAVASTIKA.

right angles, making four arms of equal size, length, and style. Their peculiarity is that all the ends are bent at right angles and in the same direction, right or left. Prof. Max Müller makes the symbol different according as the arms are bent to the right or to the left. That bent to the right he denominates the true Swastika, that bent to the left he calls Suavastika (fig. 10), but he gives no authority for the statement, and the author has been unable to find, ex-

cept in Burnouf, any justification for a difference of names. Professor Goodyear gives the title of "Meander" to that form of Swastika which bends two or more times (fig. 11).

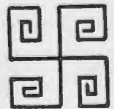


Fig. 11.
SWASTIKA.
Meander.

The Swastika is sometimes represented with dots or points in the corners of the intersections (fig. 12a), and occasionally the same when without bent ends (fig. 12b), to which Zmigrodzki gives



a



b



c

Fig. 12.

CROIX SWASTICALE (ZMIGRODZKI).

the name of *Croix Swasticale*. Some Swastikas have three dots placed equidistant around each of the four ends (fig. 12c).

¹Higgins, "Anacalypsis," London, 1836, I, p. 230.

There are several varieties possibly related to the Swastika which have been found in almost every part of the globe, and though the relation may appear slight, and at first sight difficult to trace, yet it will appear more or less intimate as the examination is pursued through its ramifications. As this paper is an investigation into and report upon facts rather than conclusions to be drawn from them, it is deemed wise to give those forms bearing even possible relations to the Swastika. Certain of them have been accepted by the author as related to the Swastika, while others have been rejected; but this rejection



Fig. 13a.

OGEE AND SPIRAL SWASTIKAS.

Tetraskelion (four-armed).

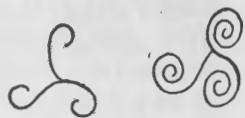


Fig. 13b.

SPIRAL AND VOLUTE.

Triskelion (three-armed).

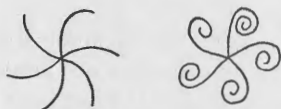


Fig. 13c.

SPIRAL AND VOLUTE.

(Five or many armed.)



Fig. 13d.

OGEE SWASTIKA, WITH

CIRCLE.

PECULIAR FORMS OF SWASTIKA.

has been confined to cases where the known facts seemed to justify another origin for the symbol. Speculation has been avoided.

NAMES AND DEFINITIONS OF THE SWASTIKA.

The Swastika has been called by different names in different countries, though nearly all countries have in later years accepted the ancient Sanskrit name of Swastika; and this name is recommended as the most definite and certain, being now the most general and, indeed, almost universal. It was formerly spelled s-v-a-s-t-i-c-a and s-u-a-s-t-i-k-a, but the later spelling, both English and French, is s-w-a-s-t-i-k-a. The definition and etymology of the word is thus given in Littre's French Dictionary:

Svastika, or *Swastika*, a mystic figure used by several (East) Indian sects. It was equally well known to the Brahmins as to the Buddhists. Most of the rock inscriptions in the Buddhist caverns in the west of India are preceded or followed by the holy (*sacramentelle*) sign of the Swastika. (Eug. Burnouf, "Le Lotus de la bonne loi." Paris, 1852, p. 625.) It was seen on the vases and pottery of Rhodes (Cyprus) and Etruria. (F. Delaunay, Jour. Off., Nov. 18, 1873, p. 7024, 3d Col.)

Etymology: A Sanskrit word signifying happiness, pleasure, good luck. It is composed of *Su* (equivalent of Greek εὖ), "good," and *asti*, "being," "good being," with the suffix *ka* (Greek κα, Latin *co*).

In the "Revue d'Ethnographie" (IV, 1885, p. 329), Mr. Dumoutier gives the following analysis of the Sanskrit *swastika* :

Su, radical, signifying *good, well, excellent, or suvidas, prosperity.*

Asti, third person, singular, indicative present of the verb *as*, to be, which is *sum* in Latin.

Ka, suffix forming the substantive.

Professor Whitney in the Century Dictionary says, Swastika—[Sanskrit, lit., "of good fortune." Svasti (*Su*, well, + *asti*, being), welfare.] Same as fylfot. Compare *Crux ansata* and *gammadion*.

In "Ilios" (p. 347), Max Müller says :

Ethnologically, *swastika* is derived from *svasti*, and *svasti* from *su*, "well," and *as*, "to be." *Svasti* occurs frequently in the Veda, both as a noun in a sense of happiness, and as an adverb in the sense of "well" or "hail!" It corresponds to the Greek *εὐεστῶ*. The derivation *Svasti-ka* is of later date, and it always means an auspicious sign, such as are found most frequently among Buddhists and Jains.

M. Eugène Burnouf¹ defines the mark Swastika as follows :

A monogrammatic sign of four branches, of which the ends are curved at right angles, the name signifying, literally, the sign of benediction or good augury.

The foregoing explanations relate only to the present accepted name "Swastika." The *sign* Swastika must have existed long before the *name* was given to it. It must have been in existence long before the Buddhist religion or the Sanskrit language.

In Great Britain the common name given to the Swastika from Anglo-Saxon times by those who apparently had no knowledge whence it came, or that it came from any other than their own country, was Fylfot, said to have been derived from the Anglo-Saxon *fower fot*, meaning four-footed, or many-footed.²

George Waring, in his work entitled "Ceramic Art in Remote Ages" (p. 10), says :

The word [Fylfot] is Scandinavian and is compound of Old Norse *fjöl*, equivalent to the Anglo-Saxon *fela*, German *viel*, many, and *fotr*, foot, the many-footed figure.

* * * It is desirable to have some settled name by which to describe it. we will take the simplest and most descriptive, the "Fylfot."

He thus transgresses one of the oldest and soundest rules of scientific nomenclature, and ignores the fact that the name Swastika has been employed for this sign in the Sanskrit language (the etymology of the word naturally gave it the name Svastika, *sv*—good or well, *asti*—to be or being, or it is) and that two thousand and more years of use in Asia and Europe had sanctioned and sanctified that as its name. The use of Fylfot is confined to comparatively few persons in Great Britain



¹ "Des Sciences et Religion," p. 256.

² R. P. Greg, "The Fylfot and Swastika," *Archæologia*, XLVIII, part 2, 1885, p. 298; Goblet d'Alviella, "Migration des Symboles," p. 50.

and, possibly, Scandinavia. Outside of these countries it is scarcely known, used, or understood.

The Swastika was occasionally called in the French language, in earlier times, *Croix gammée* or *Gammadion*, from its resemblance to a combination of four of the Greek letters of that name, and it is so named by Count Goblet d'Alviella in his late work, "La Migration des Symboles." It was also called *Croix cramponnée*, *Croix pattée*, *Croix à crochet*. But the consensus even of French etymologists favors the name Swastika.

Some foreign authors have called it Thor's hammer, or Thor's hammer-mark, but the correctness of this has been disputed.¹ Waring, in his elaborate work, "Ceramic Art in Remote Ages,"² says:

The  used to be vulgarly called in Scandinavia the hammer of Thor, and Thor's hammer-mark, or the hammer-mark, but this name properly belongs to the mark .

Ludwig Müller gives it as his opinion that the Swastika has no connection with the Thor hammer. The best Scandinavian authors report the "Thor hammer" to be the same as the Greek tau (fig. 5), the same form as the Roman and English capital T. The Scandinavian name is Miölner or Mjølner, the crusher or mallet.

The Greek, Latin, and Tau crosses are represented in Egyptian hieroglyphics by a hammer or mallet, giving the idea of crushing, pounding, or striking, and so an instrument of justice, an avenger of wrong,³ hence standing for Horus and other gods.⁴ Similar symbolic meanings have been given to these crosses in ancient classic countries of the Orient.⁵

SYMBOLISM AND INTERPRETATION.

Many theories have been presented concerning the symbolism of the Swastika, its relation to ancient deities and its representation of certain qualities. In the estimation of certain writers it has been respectively the emblem of Zeus, of Baal, of the sun, of the sun-god, of the sun-chariot of Agni the fire-god, of Indra the rain-god, of the sky, the sky-god, and finally the deity of all deities, the great God, the Maker and Ruler of the Universe. It has also been held to symbolize light or the god of light, of the forked lightning, and of water. It is believed by some to have been the oldest Aryan symbol. In the estimation of others it represents Brahma, Vishnu, and Siva, Creator, Preserver, Destroyer. It appears in the footprints of Buddha, engraved upon the

¹Stephens, "Old Northern Runic Monuments," part II, p. 509; Ludwig Müller, quoted on p. 778 of this paper; Goblet d'Alviella, "La Migration des Symboles," p. 45; Haddon, "Evolution in Art," p. 288.

²Page 12.

³"La Migration des Symboles," pp. 21, 22.

⁴"Le Culte de la Croix avant Jésus-Christ," in the *Correspondant*, October 25, 1889, and in *Science Catholique*, February 15, 1890, p. 163.

⁵Same authorities.

solid rock on the mountains of India (fig. 32). It stood for the Jupiter Tonans and Pluvius of the Latins, and the Thor of the Scandinavians. In the latter case it has been considered—erroneously, however—a variety of the Thor hammer. In the opinion of at least one author it had an intimate relation to the Lotus sign of Egypt and Persia. Some authors have attributed a phallic meaning to it. Others have recognized it as representing the generative principle of mankind, making it the symbol of the female. Its appearance on the person of certain goddesses, Artemis, Hera, Demeter, Astarte, and the Chaldean Nana, the leaden goddess from Hissarlik (fig. 125), has caused it to be claimed as a sign of fecundity.

In forming the foregoing theories their authors have been largely controlled by the alleged fact of the substitution and permutation of the Swastika sign on various objects with recognized symbols of these different deities. The claims of these theorists are somewhat clouded in obscurity and lost in the antiquity of the subject. What seems to have been at all times an attribute of the Swastika is its character as a charm or amulet, as a sign of benediction, blessing, long life, good fortune, good luck. This character has continued into modern times, and while the Swastika is recognized as a holy and sacred symbol by at least one Buddhistic religious sect, it is still used by the common people of India, China, and Japan as a sign of long life, good wishes, and good fortune.

Whatever else the sign Swastika may have stood for, and however many meanings it may have had, it was always ornamental. It may have been used with any or all the above significations, but it was always ornamental as well.

The Swastika sign had great extension and spread itself practically over the world, largely, if not entirely, in prehistoric times, though its use in some countries has continued into modern times.

The elaboration of the meanings of the Swastika indicated above and its dispersion or migrations form the subject of this paper.

Dr. Schliemann found many specimens of Swastika in his excavations at the site of ancient Troy on the hill of Hissarlik. They were mostly on spindle whorls, and will be described in due course. He appealed to Prof. Max Müller for an explanation, who, in reply, wrote an elaborate description, which Dr. Schliemann published in "Ilios."¹

He commences with a protest against the word Swastika being applied generally to the sign Swastika, because it may prejudice the reader or the public in favor of its Indian origin. He says:

I do not like the use of the word *svastika* outside of India. It is a word of Indian origin and has its history and definite meaning in India. * * * The occurrence of such crosses in different parts of the world may or may not point to a common origin, but if they are once called *Svastika* the *vulgus profanum* will at once

¹ Page 346, et seq.

jump to the conclusion that they all come from India, and it will take some time to weed out such prejudice.

Very little is known of Indian art before the third century B. C., the period when the Buddhist sovereigns began their public buildings.¹

The name Svastika, however, can be traced (in India) a little farther back. It occurs as the name of a particular sign in the old grammar of Pānani, about a century earlier. Certain compounds are mentioned there in which the last word is *karna*, "ear." * * * One of the signs for marking cattle was the Svastika [fig. 41], and what Pānani teaches in his grammar is that when the compound is formed, *svastika-karna*, i. e., "having the ear marked with the sign of a Svastika," the final *a* of Svastika is not to be lengthened, while it is lengthened in other compounds, such as *datra-karna*, i. e., "having the ear marked with the sign of a sickle."

D'Alviella² reinforces Max Müller's statement that Panini lived during the middle of the fourth century, B. C. Thus it is shown that the word Swastika had been in use at that early period long enough to form an integral part of the Sanskrit language and that it was employed to illustrate the particular sounds of the letter *a* in its grammar.

Max Müller continues his explanation:³

It [the Swastika] occurs often at the beginning of the Buddhist inscriptions, on Buddhist coins, and in Buddhist manuscripts. Historically, the Svastika is first attested on a coin of Krananda, supposing Krananda to be the same king as Xandrames, the predecessor of Sandrokyptos, whose reign came to an end in 315 B. C. (See Thomas on the Identity of Xandrames and Krananda.) The paleographic evidence, however, seems rather against so early a date. In the footprints of Buddha the Buddhists recognize no less than sixty-five auspicious signs, the first of them being the *Svastika* [see fig. 32], (Eugene Burnouf, "Lotus de la bonne loi," p. 625); the fourth is the *Suavastika*, or that with the arms turned to the left [see fig. 10]; the third, the *Nandyāvarta* [see fig. 14], is a mere development of the *Svastika*. Among the Jainas the *Svastika* was the sign of their seventh Jina, Supārsva (Colebrooke "Miscellaneous Essays," II, p. 188; Indian Antiquary, vol. 2, p. 135).

In the later Sanskrit literature, *Svastika* retains the meaning of an auspicious mark; thus we see in the Rāmāyana (ed. Gorresio, II, p. 348) that Bharata selects a ship marked with the sign of the Svastika. Varāhamihira in the Brihat-samhitā (Med. Sæc., VI, p. Ch.) mentions certain buildings called Svastika and Nandyāvarta (53.34, seq.), but their outline does not correspond very exactly with the form of the signs. Some Sthūpas, however, are said to have been built on the plan of the Svastika. * * * Originally, *svastika* may have been intended for no more than two lines crossing each other, or a cross. Thus we find it used in later times referring to a woman covering her breast with crossed arms (Bālarām, 75.16), *svuhastastika-stani*, and likewise with reference to persons sitting crosslegged.

Dr. Max Ohnefalsch-Richter⁴ speaking of the Swastika position, either of crossed legs or arms, among the Hindus,⁵ suggests as a possible explanation that these women bore the Swastikas upon their

¹The native Buddhist monarchs ruled from about B. C. 500 to the conquest of Alexander, B. C. 330. See "The Swastika on ancient coins," Chapter II of this paper, and Waring, "Ceramic Art in Remote Ages," p. 83.

²"La Migration des symboles," p. 104.


³"Ilios," pp. 347, 348.

⁴Bulletins de la Société d'Anthropologie, 1888, p. 678.

⁵Mr. Gandhi makes the same remark in his letter on the Buddha shell statue shown in pl. 10 of this paper.

arms as did the goddess Aphrodite, in fig. 8 of his writings, (see fig. 180 in the present paper), and when they assumed the position of arms crossed over their breast, the Swastikas being brought into prominent view, possibly gave the name to the position as being a representative of the sign.

Max Müller continues¹:

Quite another question is, why the sign  should have had an auspicious meaning, and why in Sanskrit it should have been called Svastika. The similarity between the group of letters *sv* in the ancient Indian alphabet and the sign of Svastika is not very striking, and seems purely accidental.

A remark of yours [Schliemann] (Troy, p. 38) that the Svastika resembles a wheel in motion, the direction of the motion being indicated by the crampons, contains a useful hint, which has been confirmed by some important observations of Mr. Thomas, the distinguished Oriental numismatist, who has called attention to the fact that in the long list of the recognized devices of the twenty-four Jaina Tirthankaras the sun is absent, but that while the eighth Tirthankara has the sign of the half-moon, the seventh Tirthankara is marked with the Svastika, i. e., the sun. Here, then, we have clear indications that the Svastika, with the hands pointing in the right direction, was originally a symbol of the sun, perhaps of the vernal sun as opposed to the autumnal sun, the *Suavastika*, and, therefore, a natural symbol of light, life, health, and wealth.

But, while from these indications we are justified in supposing that among the Aryan nations the Svastika may have been an old emblem of the sun, there are other indications to show that in other parts of the world the same or a similar emblem was used to indicate the earth. Mr. Beal * * * has shown * * * that the simple cross (+) occurs as a sign for earth in certain ideographic groups. It was probably intended to indicate the four quarters—north, south, east, west—or, it may be, more generally, extension in length and breadth.

That the cross is used as a sign for "four" in the Bactro-Pali inscriptions (Max Müller, "Chips from a German Workshop," Vol. II, p. 298) is well known; but the fact that the same sign has the same power elsewhere, as, for instance, in the Hieratic numerals, does not prove by any means that the one figure was derived from the other. We forget too easily that what was possible in one place was possible also in other places; and the more we extend our researches, the more we shall learn that the chapter of accidents is larger than we imagine.

The "*Suavastika*" which Max Müller names and believes was applied to the Swastika sign, with the ends bent to the left (fig. 10), seems not to be reported with that meaning by any other author except Burnouf.² Therefore the normal Swastika would seem to be that with the ends bent to the right. Burnouf says the word *Suavastika* may be a derivative or development of the *Svastikaya*, and ought to signify "he who, or, that which, bears or carries the Swastika or a species of Swastika." Greg,³ under the title *Sôvastikaya*, gives it as his opinion that there is no difference between it and the Swastika. Colonel Low⁴ mentions the word *Sawattheke*, which, according to Burnouf⁵ is only a variation of

¹ "Ilios," p. 348.

² "Lotus de la Bonne Loi," App. VIII, p. 626, note 4.

³ *Archæologia*, p. 36.

⁴ *Transactions of the Royal Asiatic Society of Great Britain*, III, p. 120.

⁵ "Lotus de la Bonne Loi," App. VIII, p. 625, note 2.

the Pali word *Sotthika* or *Suvatthika*, the Pali translation of the Sanskrit *Swastika*. Burnouf translates it as *Svastikaya*.

M. Eugene Burnouf¹ speaks of a third sign of the footprint of Çakya, called *Nandâvartaya*, a good augury, the meaning being the "circle of fortune," which is the *Swastika* inclosed within a square with avenues radiating from the corners (fig. 14). Burnouf says the above sign has many significations. It is a sacred temple or edifice, a species of labyrinth, a garden of diamonds, a chain, a golden waist or shoulder belt, and a conique with spires turning to the right.

Colonel Sykes² concludes that, according to the Chinese authorities *Fa-hian*, *Soung Young*, *Hiuan thsang*, the "Doctors of reason," *Tao-sse*, or followers of the mystic cross 卐 were diffused in China and India before the advent of *Sakya* in the sixth century B. C. (according to Chinese, Japanese, and Buddhist authorities, the eleventh century B. C.),

continuing until *Fa-hian*'s time; and that they were professors of a qualified Buddhism, which, it is stated, was the universal religion of Tibet before *Sakya*'s advent,³ and continued until the introduction of orthodox Buddhism in the ninth century A. D.⁴

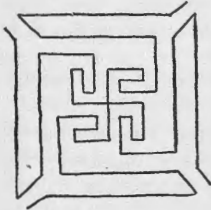


Fig. 14.

NANDÂVARTAYA, A THIRD
SIGN OF THE FOOTPRINT OF
BUDDHA.

Burnouf, "Lotus de la Bonne Loi,"
Paris, 1852, p. 626.

*Klaproth*⁵ calls attention to the frequent mention by *Fa-hian*, of the *Tao-sse*, sectaries of the mystic cross 卐 (Sanskrit *Swastika*), and to their existence in Central Asia and India; while he says they were diffused over the countries to the west and southwest of China, and came annually from all kingdoms and countries to adore *Kassapo*,

Buddha's predecessor.⁶ Mr. James Burgess⁷ mentions the *Tirthankaras* or *Jainas* as being sectarians of the Mystic Cross, the *Swastika*.

The *Cyclopædia of India* (title *Swastika*), coinciding with Prof. Max Müller, says:

The *Swastika* symbol is not to be confounded with the *Swastika* sect in Tibet which took the symbol for its name as typical of the belief of its members. They render the Sanskrit *Swastika* as composed of *su* "well" and *asti* "it is," meaning, as Professor Wilson expresses it, "so be it," and implying complete resignation under all circumstances. They claimed the *Swastika* of Sanskrit as the *suti* of Pali, and that the *Swastika* cross was a combination of the two symbols *sutti-suti*. They are rationalists, holding that contentment and peace of mind should be the only objects of life. The sect has preserved its existence in different localities and under different names, *Thirthankara*, *Ter*, *Musteg*, *Pon*, the last name meaning purity, under which a remnant are still in the farthest parts of the most eastern province of Tibet.

¹"Lotus de la Bonne Loi," p. 626.

²"Notes on the Religious, Moral, and Political state of India," Journ. Asiatic Soc. Great Britain, VI, pp. 310-334.

³Low, Trans. Roy. Asiatic Soc. of Great Britain III, pp. 334, 310.

⁴Ibid., p. 299.

⁵Ibid., p. 299.

⁶Low, Trans. Royal Asiatic Soc. of Great Britain, III, p. 310.

⁷Indian Antiquary, II, May, 1873, p. 135.

General Cunningham¹ adds his assertion of the Swastika being the symbol used by the Buddhist sect of that name. He says in a note:

The founder of this sect flourished about the year 604 to 523 B. C., and that the mystic cross is a symbol formed by the combination of the two Sanskrit syllables *su* and *ti-suti*.

Waring² proceeds to demolish these statements of a sect named Swastika as pure inventions, and "consulting Professor Wilson's invaluable work on the Hindoo religious sects in the 'Asiatic Researches,' we find no account of any sect named Swastika."

Mr. V. R. Gandhi, a learned legal gentleman of Bombay, a representative of the Jain sect of Buddhists to the World's Parliament of Religions at Chicago, 1893, denies that there is in either India or Tibet a sect of Buddhists named "Swastika." He suggests that these gentlemen probably mean the sects of Jains (of which Mr. Gandhi is a member), because this sect uses the Swastika as a sign of benediction and blessing. This will be treated further on. (See p. 804.)

Zmigrodzki, commenting on the frequency of the Swastika on the objects found by Dr. Schliemann at Hissarlik, gives it as his opinion³ that these representations of the Swastika have relation to a human cult indicating a supreme being filled with goodness toward man. The sun, stars, etc., indicate him as a god of light. This, in connection with the idol of Venus, with its triangular shield engraved with a Swastika (fig. 125), and the growing trees and palms, with their increasing and multiplying branches and leaves, represent to him the idea of fecundity, multiplication, increase, and hence the god of life as well as of light. The Swastika sign on funeral vases indicates to him a belief in a divine spirit in man which lives after death, and hence he concludes that the people of Hissarlik, in the "Burnt City" (the third of Schliemann), adored a supreme being, the god of light and of life, and believed in the immortality of the soul.

R. P. Greg says:⁴

Originally it [the Swastika] would appear to have been an early Aryan atmospheric device or symbol indicative of both rain and lightning, phenomena appertaining to the god Indra, subsequently or collaterally developing, possibly, into the Suastika, or sacred fire churn in India, and at a still later period in Greece, adopted rather as a solar symbol, or converted about B. C. 650 into the meander or key pattern.

Waring, while he testifies to the extension of the Swastika both in time and area, says:⁵

But neither in the hideous jumble of Pantheism—the wild speculative thought, mystic fables, and perverted philosophy of life among the Buddhists—nor in the equally wild and false theosophy of the Brahmins, to whom this symbol, as distinc-

¹"Bilsa Topes," p. 17.

²"Ceramic Art in Remote Ages," p. 12.

³Tenth Congress International d'Anthropologie et d'Archæologie Préhistoriques, Paris, 1889, p. 474.

⁴Archæologia, XLVII, pt. 1, p. 159.

⁵"Ceramic Art in Remote Ages," p. 11.

tive of the Vishnavas, sectarian devotees of Vishnu, is ascribed by Moor in his "Indian Pantheon," nor yet in the tenets of the Jains,¹ do we find any decisive explanation of the meaning attached to this symbol, although its allegorical intention is indubitable.

He mentions the Swastika of the Buddhists, the cross, the circle, their combination, the three-foot Y and adds: "They exhibit forms of those olden and widely spread pagan symbols of Deity and sanctity, eternal life and blessing."

Professor Sayce says:²

The Cyprian vase figured in Di Cesnola's "Cyprus," pl. XLV, fig. 36 [see fig. 156], which associates the Swastika with the figure of an animal, is a striking analogue of the Trojan whorls on which it is associated with the figures of stags. The fact that it is drawn within the vulva of the leaden image of the Asiatic goddess [see fig. 125] seems to show that it was a symbol of generation. I believe that it is identical with the Cyprian character 𐤊 or 𐤋 (ne), which has the form 𐤌 in the inscription of Golgi, and also with the Hittite 𐎎 or 𐎏 which Dr. Hyde Clarke once suggested to me was intended to represent the organs of generation.

Mr. Waller, in his work entitled "Monumental Crosses," describes the Swastika as having been known in India as a sacred symbol many centuries before our Lord, and used as the distinguishing badge of a religious sect calling themselves "Followers of the Mystic Cross." Subsequently, he says, it was adopted by the followers of Buddha and was still later used by Christians at a very early period, being first introduced on Christian monuments in the sixth century. But Mr. Waring says that in this he is not correct, as it was found in some of the early paintings in the Roman catacombs, particularly on the habit of a *Fossor*, or gravedigger, given by D'Agincourt.

Pugin, in his "Glossary of Ornament," under the title "Fylfot," says that in Tibet the Swastika was used as a representation of God crucified for the human race, citing as his authority F. Augustini Antonii Georgii.³ He remarks:

From these accounts it would appear that the fylfot is a mystical ornament, not only adopted among Christians from primitive times, but used, as if prophetically, for centuries before the coming of our Lord. To descend to later times, we find it constantly introduced in ecclesiastical vestments, * * * till the end of the fifteenth century, a period marked by great departure from traditional symbolism.

Its use was continued in Tibet into modern times, though its meaning is not given.⁴ (See p. 802.)

The Rev. G. Cox, in his "Aryan Mythology," says:

We recognize the male and the female symbol in the trident of Poseidon, and in the fylfot or hammer of Thor, which assumes the form of a cross-pattée in the various legends which turn on the rings of Freya, Holda, Venus, or Aphrodite.

¹ See explanation of the Swastika by Mr. Gandhi according to the Jain tenets, p. 804.

² "Ilios," p. 353.

³ "Alphabetum Tibetarium," Rome, 1762, pp. 211, 460, 725.

⁴ Rockhill, "Diary of a Journey through Mongolia and Tibet," Smithsonian Institution, Washington, 1894, p. 67.

Here again we find the fylfot and cross-pattée spoken of as the same symbol, and as being emblematic of the reproductive principles, in which view of its meaning Dr. Inman, in his "Ancient Faiths Embodied in Ancient Names," concurs.

Burnouf¹ recounts the myth of Agni (from which comes, through the Latin *ignis*, the English word igneous), the god of Sacred Fire, as told in the Veda:²

The young queen, the mother of Fire, carried the royal infant mysteriously concealed in her bosom. She was a woman of the people, whose common name was "Arani"—that is, the instrument of wood (the Swastika) from which fire was made or brought by rubbing. * * * The origin of the sign [Swastika] is now easy to recognize. It represents the two pieces of wood which compose *l'arani*, of which the extremities were bent to be retained by the four nails. At the junction of the two pieces of wood was a fossette or cup-like hole, and there they placed a piece of wood upright, in form of a lance (the Pramantha), violent rotation of which, by whipping (after the fashion of top-whipping), produced fire, as did Prometheus, the *porteur du feu*, in Greece.

And this myth was made, as have been others, probably by the priests and poets of succeeding times, to do duty for different philosophies. The Swastika was made to represent Arani (the female principle); the Pramantha or upright fire stake representing Agni, the fire god (the male); and so the myth served its part to account for the birth of fire. Burnouf hints that the myth grew out of the production of holy fire for the sacred altars by the use of the Pramantha and Swastika, after the manner of savages in all times. Zmigrodzki accepts this myth, and claims all specimens with dots or points—supposed nail holes—as Swastikas.

The Count Goblet d'Alviella³ argues in opposition to the theory announced by Burnouf and by Zmigrodzki, that the Swastika or *croix swastical*, when presenting dots or points, had relation to fire making. He denies that the points represent nails, or that nails were made or necessary either for the Swastika or the Arani, and concludes that there is no evidence to support the theory, and nothing to show the Swastika to have been used as a fire-making apparatus, whether with or without the dots or points.

Mr. Greg⁴ opposes this entire theory, saying:

The difficulty about the Swastika and its supposed connection with fire appears to me to lie in not knowing precisely what the old fire drill and chark were like. * * * I much doubt whether the Swastika had originally any connection either with the fire-chark or with the sun. * * * The best authorities consider Burnouf is in error as to the earlier use of the two lower cross pieces of wood and the four nails said to have been used to fix or steady the framework.

He quotes from Tylor's description⁵ of the old fire drill used in India

¹ "Des Sciences et Religion," pp. 252, 257.

² Vol. XI.

³ "La Migration des Symboles," pp. 61-63.

⁴ *Archæologia*, XLVIII, pt. 2, pp. 322, 323.

⁵ "Early History of Mankind," p. 257, note C.

for kindling the sacrificial fire by the process called "churning," as it resembles that in India by which butter is separated from milk. It consists in drilling one piece of Arani wood by pulling a cord with one hand while the other is slackened, and so, alternately (the strap drill), till the wood takes fire. Mr. Greg states that the Eskimos use similar means, and the ancient Greeks used the drill and cord, and he adds his conclusions: "There is nothing of the Swastika and four nails in connection with the fire-churn."

Burton¹ also criticises Burnouf's theory:

If used on sacrificial altars to reproduce the holy fire, the practice is peculiar and not derived from everyday life; for as early as Pliny they knew that the savages used two, and never three, fire sticks.

Burnouf continues his discussion of myths concerning the origin of fire:

According to Hymnes, the discoverer of fire was Atharan, whose name signifies fire, but Bhrigon it was who made the sacred fire, producing resplendent flames on the earthen altar. In theory of physics, Agni, who was the fire residing within the "onction," (?) came from the milk of the cow, which, in its turn, came from the plants that had nourished her; and these plants in their turn grew by receiving and appropriating the heat or fire of the sun. Therefore, the virtue of the "onction" came from the god.

One of the Vedas says of Agni, the god of fire:²

Agni, thou art a sage, a priest, a king,
Protector, father of the sacrifice;
Commissioned by our men thou dost ascend
A messenger, conveying to the sky
Our hymns and offerings, though thy origin
Be three fold, now from air and now from water,
Now from the mystic double *Arani*.³

Count Goblet d'Alviella combats the hypothesis of Burnouf that the Swastika when turned to right or left, passed, the one for the male and the other for the female principle, and declares, on the authority of Sir George Birdwood, that it is, in modern India, a popular custom to name objects which appear in couples as having different sexes, so that to say "the male Swastika" and the "female Swastika," indicating them by the pronouns "he" or "she," would be expressed in the same manner when speaking of the hammer and the anvil or of any other objects used in pairs.⁴

Ludwig Müller, in his elaborate treatise, gives it as his opinion that the Swastika had no connection with the Tau cross or with the *Crux ansata*, or with the fire wheel, or with arani, or agni, or with the mystic or alphabetic letters, nor with the so-called spokes of the solar wheel, nor the forked lightning, nor the hammer of Thor. He considers that the tris-

¹ "The Book of the Sword," p. 202, note 2.

² Burnouf, "Des Sciences et Religion," p. 18.

³ The two pieces of wood of *Ficus religiosa*, used for kindling fire.

⁴ "La Migration des Symboles," p. 63.

kelion might throw light on its origin, as indicating perpetual whirling or circular movement, which, in certain parts of southern Asia as the emblem of Zeus, was assimilated to that of Baal, an inference which he draws from certain Asiatic coins of 400 B. C.

Mr. R. P. Greg¹ opposes this theory and expresses the opinion that the Swastika is far older and wider spread as a symbol than the triskelion, as well as being a more purely Aryan symbol. Greg says that Ludwig Müller attaches quite too much importance to the sun in connection with the early Aryans, and lays too great stress upon the supposed relation of the Swastika as a solar symbol. The Aryans, he says, were a race not given to sun worship; and, while he may agree with Müller that the Swastika is an emblem of Zeus and Jupiter merely as the Supreme God, yet he believes that the origin of the Swastika had no reference to a movement of the sun through the heavens; and he prefers his own theory that it was a device suggested by the forked lightning as the chief weapon of the air god.

Mr. Greg's paper is of great elaboration, and highly complicated. He devotes an entire page or plate (21) to a chart showing the older Aryan fire, water, and sun gods, according to the Brahmin or Buddhist system. The earliest was Dyaus, the bright sky or the air god; Adyti, the infinite expanse, mother of bright gods; Varuna, the covering of the shining firmament. Out of this trinity came another, Zeus, being the descendant of Dyaus, the sky god; Agni, the fire; Sulya, the sun, and Indra, the rain god. These in their turn formed the great Hindu trinity, Brahma, Vishnu, and Siva—creator, preserver, and destroyer; and, in his opinion, the Swastika was the symbol or ordinary device of Indra as well as of Zeus. He continues his table of descent from these gods, with their accompanying devices, to the sun, lightning, fire, and water, and makes almost a complete scheme of the mythology of that period, into which it is not possible to follow him. However, he declines to accept the theory of Max Müller of any difference of form or meaning between the Suavastika and the Swastika because the ends or arms turned to the right or to the left, and he thinks the two symbols to be substantially the same. He considers it to have been, in the first instance, exclusively of early Aryan origin and use, and that down to about 600 B. C. it was the emblem or symbol of the supreme Aryan god; that it so continued down through the various steps of descent (according to the chart mentioned) until it became the device and symbol of Brahma, and finally of Buddha. He thinks that it may have been the origin of the Greek fret or meander pattern. Later still it was adopted even by the early Christians as a suitable variety of their cross, and became variously modified in form and was used as a charm.

D'Alviella² expresses his doubts concerning the theory advanced by Greg³ to the effect that the Swastika is to be interpreted as a symbol

¹ *Archæologia*, XLIII, pt. 2, pp. 324, 325.

² "La Migration des Symboles," p. 64.

³ "Fylfot and Swastika," *Archæologia*, 1885, p. 293.

of the air or of the god who dwells in the air, operating sometimes to produce light, other times rain, then water, and so on, as is represented by the god Indra among the Hindus, Thor among the Germans and Scandinavians, Perkun among the Slavs, Zeus among the Pelasgi and Greeks, Jupiter Tonans, and Pluvius among the Latins. He disputes the theory that the association of the Swastika sign with various others on the same object proves its relationship with that object or sign. That it appears on vases or similar objects associated with what is evidently a solar disk is no evidence to him that the Swastika belongs to the sun, or when associated with the zigzags of lightning that it represents the god of lightning, nor the same with the god of heaven. The fact of its appearing either above or below any one of these is, in his opinion, of no importance and has no signification, either general or special.

D'Alviella says¹ that the only example known to him of a Swastika upon a monument consecrated to Zeus or Jupiter is on a Celto-Roman altar, erected, according to all appearances, by the Daci during the time they were garrisoned at Ambloganna, in Britain. The altar bears the letters I. O. M., which have been thought to stand for Jupiter Optimus Maximus. The Swastika thereon is flanked by two disks or rouelles, with four rays, a sign which M. Gaidoz believes to have been a representative of the sun among the Gaulois.²

Dr. Brinton³ considers the Swastika as being related to the cross and not to the circle, and asserts that the Ta Ki or Triskeles, the Swastika and the Cross, were originally of the same signification, or at least closely allied in meaning.

Waring,⁴ after citing his authorities, sums up his opinion thus:

We have given remarks of the various writers on this symbol, and it will be seen that, though they are more or less vague, uncertain, and confused in their description of it, still, with one exception, they all agree that it is a mystic symbol, peculiar to some deity or other, bearing a special signification, and generally believed to have some connection with one of the elements—water.

Burton says:⁵

The Svastika is apparently the simplest form of the Guilloche [scroll pattern or spiral]. According to Wilkinson (11, Chap. IX), the most complicated form of the Guilloche covered an Egyptian ceiling upward of a thousand years older than the objects found at Nineveh. The Svastika spread far and wide, everywhere assuming some fresh mythological and mysterious significance. In the north of Europe it became the Fylfot or Crutched cross.

Count Goblet d'Alviella is of the opinion (p. 57) that the Swastika was "above all an amulet, talisman, or phylactere," while (p. 56) "it is incontestable that a great number of the Swastikas were simply motifs

¹ "La Migration des Symboles," p. 65.

² "Le Dieu gaulois du Soleil et le symbolisme de la roue," Paris, 1886.

³ Proc. Amer. Philosoph. Soc., 1889, pp. 177-187.

⁴ "Ceramic Art in Remote Ages."

⁵ "The Book of the Sword," p. 202.

of ornamentation, of coin marks, and marks of fabrics," but he agrees (p. 57) that there is no symbol that has given rise to so many interpretations, not even the *tricula* of the Buddhists, and "this is a great deal to say." Ludwig Müller believes the Swastika to have been used as an ornament and as a charm and amulet, as well as a sacred symbol.

Dr. H. Colley March, in his learned paper on the "Fylfot and the Futhorc Tir,"¹ thinks the Swastika had no relation to fire or fire making or the fire god. His theory is that it symbolized axial motion and not merely gyration; that it represented the celestial pole, the axis of the heavens around which revolve the stars of the firmament. This appearance of rotation is most impressive in the constellation of the Great Bear. About four thousand years ago the apparent pivot of rotation was at α *Draconis*, much nearer the Great Bear than now, and at that time the rapid circular sweep must have been far more striking than at present. In addition to the name *Ursa Major* the Latins called this constellation *Septentriones*, "the seven plowing oxen," that dragged the stars around the pole, and the Greeks called it *ἑλικη*, from its vast spiral movement.² In the opinion of Dr. March all these are represented or symbolized by the Swastika.

Prof. W. H. Goodyear, of New York, has lately (1891) published an elaborate quarto work entitled "The Grammar of the Lotus: A New History of Classic Ornament as a Development of Sun Worship."³ It comprises 408 pages, with 76 plates, and nearly a thousand figures. His theory develops the sun symbol from the lotus by a series of ingenious and complicated evolutions passing through the Ionic style of architecture, the volutes and spirals forming meanders or Greek frets, and from this to the Swastika. The result is attained by the following line of argument and illustrations:

The lotus was a "fetish of immemorial antiquity and has been worshiped in many countries from Japan to the Straits of Gibraltar;" it was a symbol of "fecundity," "life," "immortality," and of "resurrection," and has a mortuary significance and use. But its elementary and most important signification was as a solar symbol.⁴

He describes the Egyptian lotus and traces it through an innumerable number of specimens and with great variety of form. He mentions many of the sacred animals of Egypt and seeks to maintain their relationship by or through the lotus, not only with each other but with solar circles and the sun worship.⁵ Direct association of the solar disk and lotus are, according to him, common on the monuments and on Phœnician and Assyrian seals; while the lotus and the sacred animals, as in cases cited of the goose representing Seb (solar god, and father of Osiris), also Osiris himself and Horus, the hawk and lotus, bull and

¹ Trans. Lancaster and Cheshire Antiq. Soc., 1886.

² Haddon, "Evolution in Art," London, 1895, p 288.

³ Sampson, Low, Marston & Co., London.

⁴ Goodyear, "The Grammar of the Lotus," pp. 4, 5.

⁵ *Ibid.*, p. 6.

lotus, the asp and lotus, the lion and lotus, the sphinx and lotus, the gryphon and lotus, the serpent and lotus, the ram and lotus—all of which animals, and with them the lotus, have, in his opinion, some related signification to the sun or some of his deities.¹ He is of the opinion that the lotus motif was the foundation of the Egyptian style of architecture, and that it appeared at an early date, say, the fourteenth century B. C. By intercommunication with the Greeks it formed the foundation of the Greek Ionic capital, which, he says,² "offers no



Fig. 15.

TYPICAL LOTUS ON CYPRIAN
VASES.

Fig. 16.

TYPICAL LOTUS ON RHODIAN
VASES.

Fig. 17.

TYPICAL LOTUS ON MELIAN
VASES.

From figures in Goodyear's "Grammar of the Lotus," p. 77.

dated example of the earlier time than the sixth century B. C." He supports this contention by authority, argument, and illustration.

He shows³ the transfer of the lotus motif to Greece, and its use as an ornament on the painted vases and on those from Cyprus, Rhodes, and Melos (figs. 15, 16, 17).

Chantre⁴ notes the presence of spirals similar to those of fig. 17, in the terramares of northern Italy and up and down the Danube, and his fig. 186 (fig. 17) he says represents the decorating motif, the most frequent in all that part of prehistoric Europe. He cites "Notes sur les torques ou ornements spirals."⁵

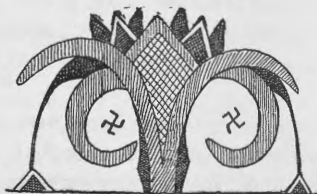


Fig. 18.

DETAIL OF CYPRIAN VASE SHOWING
LOTUSES WITH CURLING SEPAL.Metropolitan Museum of Art, New York.
Goodyear, "Grammar of the Lotus," pl. 47, fig. 1.

That the lotus had a foundation deep and wide in Egyptian mythology is not to be denied; that it was allied to and associated on the monuments and other

objects with many sacred and mythologic characters in Egypt and afterwards in Greece is accepted. How far it extends in the direction contended for by Professor Goodyear, is no part of this investigation. It appears well established that in both countries it became highly conventionalized, and it is quite sufficient for the purpose of this argument that it became thus associated with the Swastika. Figs. 18 and 19

¹Goodyear, "The Grammar of the Lotus," pp. 7, 8.²Ibid., p. 71.³Ibid., pp. 74, 77.⁴"Age du Bronze," Deuxieme partie, p. 301.⁵Matériaux pour l'Histoire Primitif et Naturelle de l'Homme, 3d ser., VIII, p. 6.

represent details of Cyprian vases and amphora belonging to the Cesnola collection in the New York Metropolitan Museum of Art, showing

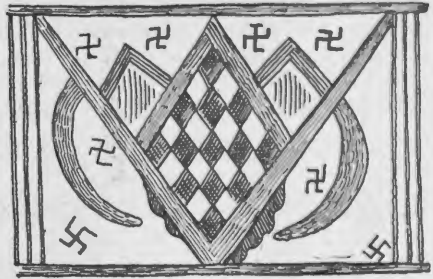
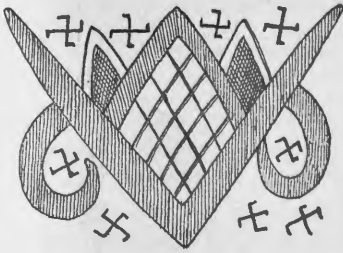


Fig. 19.

DETAIL OF CYPRIAN AMPHORA IN METROPOLITAN MUSEUM OF ART, NEW YORK CITY.
Lotus with curling sepals and different Swastikas.
Goodyear, "Grammar of the Lotus," pl. 47, figs. 2, 3.

the lotus with curling sepals among which are interspersed Swastikas of different forms.

According to Professor Goodyear,¹ these bent sepals of the lotus were exaggerated and finally became spirals,² which, being projected at a tangent, made volutes, and, continuing one after the other, as shown in fig. 20, formed bands of ornament; or,³ being connected to right and left, spread the ornament over an extended



Fig. 20.

THEORY OF THE EVOLUTION OF THE SPIRAL
SCROLL FROM LOTUS.

One volute.

Goodyear, "Grammar of the Lotus," fig. 51.

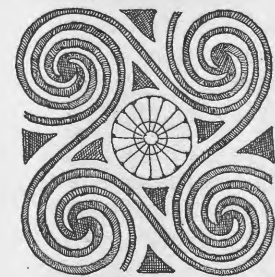


Fig. 21.

THEORY OF LOTUS RUDIMENTS IN
SPIRAL.

Tomb 33, Abd-el Kourneh, Thebes.

Goodyear, "Grammar of the Lotus," p. 96.

surface as in fig. 21. One of his paths of evolution closed these volutes and dropped the connecting tangent, when they formed the concentric rings of which we see so much. Several forms of Egyptian scarabæi, showing the evolution of concentric rings, are shown in figs. 22, 23, and 24.

By another path of the evolution of his theory, one has only to square the spiral volutes, and the result is the Greek fret shown in fig. 25.⁴ The Greek fret has only to be doubled, when it produces the Swastika shown in fig. 26.⁵ Thus we have, according to him, the origin of the Swastika, as shown in figs. 27 and 28.⁶

Professor Goodyear is authority for the statement that the earliest dated instances of the isolated scroll is in the fifth dynasty of Egypt, and of the lotus and spiral is in the eleventh dynasty. The spiral of fig. 19 (above) belongs to the twelfth dynasty.⁷

¹ "Grammar of the Lotus," pl. 8, p. 81.

² *Ibid.*, pp. 82-94.

³ *Ibid.*, p. 96.

⁴ *Ibid.*, pl. x, figs. 7-9, p. 97.

⁵ *Ibid.*, p. 354.

⁶ *Ibid.*, p. 353.

⁷ *Ibid.*, p. 354, fig. 174.

Professor Goodyear devotes an entire chapter to the Swastika. On pages 352, 353 he says:

There is no proposition in archæology which can be so easily demonstrated as the assertion that the Swastika was originally a fragment of the Egyptian meander, provided Greek geometric vases are called in evidence. The connection between



Fig. 22.

CONCENTRIC RINGS CON-
NECTED BY TANGENTS.

From a figure in Petrie's "History
of Scarabæ."



Fig. 23.

CONCENTRIC RINGS WITH DIS-
CONNECTED TANGENTS.

Barringer collection, Metropolitan Mu-
seum of Art, New York City.
Goodyear, "Grammar of the Lotus," pl
8, fig. 23.

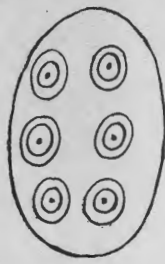


Fig. 24.

CONCENTRIC RINGS WITHOUT
CONNECTION.

Farman collection, Metropolitan Mu-
seum of Art, New York City.
Goodyear, "Grammar of the Lotus," pl.
8, fig. 25.

the meander and the Swastika has been long since suggested by Prof. A. S. Murray.¹ Hindu specialists have suggested that the Swastika produced the meander. Birdwood² says: "I believe the Swastika to be the origin of the key pattern ornament of Greek and Chinese decorative art." Zmigrodzki, in a recent publication,³ has not only repropounded this derivation of the meander, but has even connected the

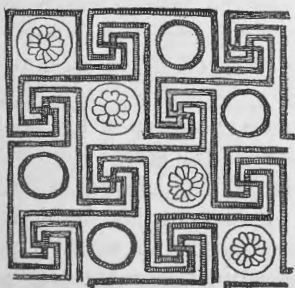


Fig. 25.

SPECIAL EGYPTIAN MEANDER.

An illustration of the theory of de-
rivation from the spiral.

Goodyear, "Grammar of the Lotus," pl. 10, fig. 9.

1, 2, 3), of the solar diagram (pl. 57, fig. 12, and pl. 60, fig. 8), of the rosette (pl. 20, fig. 8), of concentric rings (pl. 47, fig. 11), of the spiral scroll (pl. 34, fig. 8, and pl.

Mycenæ spirals with this supposed development, and has proposed to change the name of the spiral ornament accordingly. * * * The equivalence of the Swastika with the meander pattern is suggested, in the first instance, by its appearance in the shape of the meander on the Rhodian (pl. 28, fig. 7), Melian (pl. 60, fig. 8), archæic Greek (pl. 60, fig. 9, and pl. 61, fig. 12), and Greek geometric vases (pl. 56). The appearance in shape of the meander may be verified in the British Museum on one geometric vase of the oldest type, and it also occurs in the Louvre.

On page 354, Goodyear says:

The solar significance of the Swastika is proven by the Hindu coins of the Jains. Its generative significance is proven by a leaden statuette from Troy. It is an equivalent of the lotus (pl. 47, figs.

¹ Cesnola, "Cyprus, its Ancient Cities, Tombs, and Temples," p. 410.

² "Industrial Arts of India," p. 107.

³ "Zur Geschichte der Swastika."

39, fig. 2), of the geometric boss (pl. 48, fig. 12), of the triangle (pl. 46, fig. 5), and of the anthemion (pl. 28, fig. 7, and pl. 30, fig. 4). It appears with the solar deer (pl. 60, figs. 1 and 2), with the solar antelope (pl. 37, fig. 9), with the symbolic fish (pl. 42, fig. 1), with the ibex (pl. 37, fig. 4), with the solar sphinx (pl. 34, fig. 8), with the solar lion (pl. 30, fig. 4), the solar ram (pl. 28, fig. 7), and the solar horse (pl. 61, figs. 1, 4, 5, and 12). Its most emphatic and constant association is with the solar bird (pl. 60, fig. 15; fig. 173).

Count Goblet d'Alviella, following Ludwig Müller, Percy Gardner, S. Beal, Edward Thomas, Max Müller, H. Gaidoz, and other authors, accepts their theory that the Swastika was a symbolic representation of the sun or of a sun god, and argues it fully.¹ He starts with the proposition that most of the nations of the earth have represented the sun

by a circle, although some of them, notably the Assyrians, Hindus, Greeks, and Celts, have represented it by signs more or less cruciform. Examining his fig. 2, wherein signs of the various people are set forth, it is to be remarked that there is no similarity or apparent relationship between the six symbols given, either with themselves or with the sun. Only one of them, that of Assyria, pretends to be a circle; and it may or may not stand for the sun. It has no exterior rays. All the rest are crosses of different kinds. Each of the six symbols is represented as being from a single nation of people. They are prehistoric or of high antiquity, and most of them appear to have no other evidence of their representation of the sun than is contained in the sign itself, so that the first objection is to the premises, to wit, that while his symbols may have sometimes represented the sun, it is far from certain that they are used constantly or steadily as such. An objection is made to the theory or hypothesis presented by Count d'Alviella² that it is not

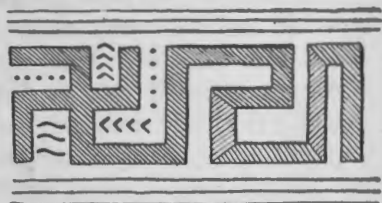


Fig. 26.

DETAIL OF GREEK VASE.
Meander and Swastika.

Goodyear, "Grammar of the Lotus," fig. 174.

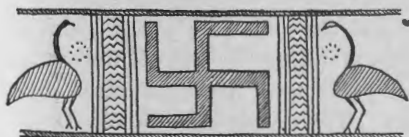


Fig. 27.

DETAIL OF GREEK GEOMETRIC VASE IN THE BRITISH MUSEUM.

Swastika, right, with solar geese.

Goodyear, "Grammar of the Lotus," p. 353, fig. 173.

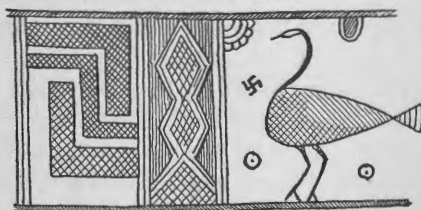


Fig. 28.

GREEK GEOMETRIC VASE.
Swastika with solar geese.

Goodyear, "Grammar of the Lotus," p. 353, fig. 172.

¹ "La Migration des Symboles," chap. 2, pt. 3, p. 66.

² *Ibid.*, p. 67.

the cross part of the Swastika which represents the sun, but its bent arms, which show the revolving motion, by which he says is evolved the tetraskelion or what in this paper is named the "Ogee Swastika." The author is more in accord with Dr. Brinton and others that the Swastika is derived from the cross and not from the wheel, that the bent arms do not represent rotary or gyratory motion, and that it had no association with, or relation to, the circle. This, if true, relieves the Swastika from all relation with the circle as a symbol of the sun. Besides, it is not believed that the symbol of the sun is one which required rotary or gyratory motion or was represented by it, but, as will be explained, in speaking of the Assyrian sun-god Shamash (p. 789), it is rather by a circle with pointed rays extending outward.

D'Alviella¹ presents several figures in support of his contention. The first (*a*) is on a fibula from Etruria (fig. 190 of this paper). His explanation is that the small circle of rays, bent at right angles, on the broad shield of the pin, represents graphically the rotary movement of the sun, and that the bent arms in the Swastikas on the same object are taken from them. It seems curious that so momentous a subject as the existence of a symbol of a great god, the god of light, heat, and thus of life, should be made to depend upon an object of so small importance. This specimen (fig. 190) is a fibula or pin, one of the commonest objects of Etruscan, Greek, or Roman dress. The decorations invoked are on the broad end, which has been flattened to protect the point of the pin, where appears a semicircle of so-called rays, the two Swastikas and two possible crosses. There is nothing about this pin, nor indeed any of the other objects, to indicate any holy or sacred character, nor that any of them were used in any ceremony having relation to the sun, to any god, or to anything holy or sacred. His fig. *b* is fig. 88 in this paper. It shows a quadrant of the sphere found by Schliemann at Hisarlik. There is a slightly indefinite circle with rays from the outside, which are bent and crooked in many directions. The sphere is of terra cotta; the marks that have been made on it are rough and ill formed. They were made by incision while the clay was soft and were done in the rudest manner. There are dozens more marks upon the same sphere, none of which seem to have received any consideration in this regard. There is a Swastika upon the sphere, and it is the only mark or sign upon the entire object that seems to have been made with care or precision. His third figure (*c*) is taken from a reliquaire of the thirteenth century A. D. It has a greater resemblance to the acanthus plant than it has to any solar disk imaginable. The other two figures (*d* and *e*) are tetraskelions or ogee Swastikas from ancient coins.

D'Alviella's next argument² is that the triskelion, formed by the same process as the tetraskelion, is an "incontestable" representation of solar

¹ "La Migration des Symboles," p. 69.

²Ibid., p. 71.

movement. No evidence is submitted in support of this assertion, and the investigator of the present day is required, as in prehistoric objects, to depend entirely upon the object itself. The bent arms contain no innate evidence (even though they should be held to represent rotary or gyratory motion) representing the sun or sun gods. It is respectfully suggested that in times of antiquity, as in modern times, the sun is not represented as having a rotary motion, but is rather represented by a circle with diminishing rays projecting from the center or exterior. It seems unjustifiable, almost ridiculous, to transform the three flexed human legs, first appearing on the coins of Lycia, into a sun symbol, to make it the reliable evidence of sun worship, and give it a holy or sacred character as representing a god. It is surely pushing the argument too far to say that this is an "incontestable" representation of the solar movement. The illustrations by d'Alviella on his page 71 are practically the same as figs. 224 to 226 of this paper.

Count d'Alviella's further argument¹ is that symbols of the sun god being frequently associated, alternated with, and sometimes replaced by, the Swastika, proves it to have been a sun symbol. But this is doubted, and evidence to sustain the proposition is wanting. Undoubtedly the Swastika was a symbol, was intentional, had a meaning and a degree of importance, and, while it may have been intended to represent the sun and have a higher and holier character, yet these mere associations are not evidence of the fact.

D'Alviella's plate 2, page 80, while divided into sections *a* and *b*, is filled only with illustrations of Swastika associated with circles, dots, etc., introduced for the purpose of showing the association of the Swastika therewith, and that the permutation and replacing of these signs by the Swastika is evidence that the Swastika represented the sun. Most of the same illustrations are presented in this paper, and it is respectfully submitted that the evidence does not bear out his conclusion. If it be established that these other symbols are representatives of the sun, how does that prove that the Swastika was itself a representative of the sun or the sun god? D'Alviella himself argues² against the proposition of equivalence of meaning because of association when applied to the *Cruce ansata*, the circle, the crescent, the triskelion, the lightning sign, and other symbolic figures. He denies that because the Swastika is found on objects associated with these signs therefore they became interchangeable in meaning, or that the Swastika stood for any of them. The Count² says that more likely the engraver added the Swastika to these in the character of a talisman or phylactery. On page 56 he argues in the same line, that because it is found on an object of sacred character does not necessarily give it the signification of a sacred or holy symbol. He regards the Swastika as

¹ "La Migration des Symboles," pp. 72, 75, 77.

² *Ibid.*, p. 61.

a symbol of good fortune, and sees no reason why it may not be employed as an invocation to a god of any name or kind on the principle, "Good Lord, good devil," quoting the Neapolitan proverb, that it will do no harm, and possibly may do good.

Prof. Max Müller¹ refers to the discovery by Prof. Percy Gardner of one of the coins of Mesembria, whereon the Swastika replaces the last two syllables of the word, and he regards this as decisive that in Greece the meaning of the Swastika was equivalent to the sun. This word, Mesembria, being translated *ville de midi*, means town or city of the south, or the sun. He cites from Mr. Thomas's paper on the "Indian Swastika and its Western Counterparts"² what he considers an equally decisive discovery made some years ago, wherein it was shown that the wheel, the emblem of the sun in motion, was replaced by the Swastika on certain coins; likewise on some of the Andhra coins and some punched gold coins noted by Sir Walter Elliott.³ In these cases the circle or wheel alleged to symbolize the sun was replaced by the Swastika. The Swastika has been sometimes inscribed within the rings or normal circles representing what is said to be the four suns on Ujain patterns or coins (fig. 230). Other authorities have adopted the same view, and have extended it to include the lightning, the storm, the fire wheel, the sun chariot, etc. (See Ohnefalsch-Richter, p. 790.) This appears to be a *non sequitur*. All these speculations may be correct, and all these meanings may have been given to the Swastika, but the evidence submitted does not prove the fact. There is in the case of the foregoing coins no evidence yet presented as to which sign, the wheel or the Swastika, preceded and which followed in point of time. The Swastika may have appeared first instead of last, and may not have been a substitution for the disk, but an original design. The disk employed, while possibly representing the sun in some places, may not have done so always nor in this particular case. It assumes too much to say that every time a small circle appears on an ancient object it represented the sun, and the same observation can be made with regard to symbols of the other elements. Until it shall have been satisfactorily established that the symbols represented these elements with practical unanimity, and that the Swastika actually and intentionally replaced it as such, the theory remains undemonstrated, the burden rests on those who take the affirmative side; and until these points shall have been settled with some degree of probability the conclusion is not warranted.

As an illustration of the various significations possible, one has but to turn to Chapter IV, on the various meanings given to the cross among American Indians, where it is shown that among these Indians the cross represented the four winds, the sun, stars, dwellings, the dragon

¹ Athenæum, August 20, 1892, p. 266.

² Numismatic Chronicle, 1880, xx, pp. 18-48.

³ Madras Journ. of Lit. and Sci., III, pl. 9.

fly, midē' society, flocks of birds, human form, maidenhood, evil spirit, and divers others.

Mr. Edward Thomas, in his work entitled "The Indian Swastika and its Western Counterparts,"¹ says:

As far as I have been able to trace or connect the various manifestations of this emblem [the Swastika], they one and all resolve themselves into the primitive conception of solar motion, which was intuitively associated with the rolling or wheel-like projection of the sun through the upper or visible arc of the heavens, as understood and accepted in the crude astronomy of the ancients. The earliest phase of astronomical science we are at present in position to refer to, with the still extant aid of indigenous diagrams, is the Chaldean. The representation of the sun in this system commences with a simple ring or outline circle, which is speedily advanced toward the impression of onward revolving motion by the insertion of a cross or four wheel-like spokes within the circumference of the normal ring. As the original Chaldean emblem of the sun was typified by a single ring, so the Indian mind adopted a similar definition, which remains to this day as the ostensible device or cast-mark of the modern Sauras or sun worshipers.

The same remarks are made in "Ilios" (pp. 353, 354).

The author will not presume to question, much less deny, the facts stated by this learned gentleman, but it is to be remarked that, on the theory of presumption, the circle might represent many other things than the sun, and unless the evidence in favor of the foregoing statement is susceptible of verification, the theory can hardly be accepted as conclusive. Why should not the circle represent other things than the sun? In modern astronomy the full moon is represented by the plain circle, while the sun, at least in heraldry, is always represented as a circle with rays. It is believed that the "cross or four wheel-like spokes" in the Chaldean emblem of the sun will be found to be rays rather than cross or spokes. A cast is in the U. S. National Museum (Cat. No. 154766) of an original specimen from Niffer, now in the Royal Museum, Berlin, of Shamash, the Assyrian god of the sun. He is represented on this monument by a solar disk, 4 inches in diameter, with eight rays similar to those of stars, their bases on a faint circle at the center, and tapering outwards to a point, the whole surrounded by another faint circle. This is evidence that the sun symbol of Assyria required rays as well as a circle. A similar representation of the sun god is found on a tablet discovered in the temple of the Sun God at Abu-Habba.²

Perrot and Chipiez³ show a tablet from Sippara, of a king, Nabuabal-iddin, 900 B. C., doing homage to the sun god (identified by the inscription), who is represented by bas-relief of a small circle in the center, with rays and lightning zigzags extending to an outer circle.

In view of these authorities and others which might be cited, it is

¹London, 1880.




²Rawlinson, "Cuneiform Inscriptions of Western Asia," v, pl. 60; Trans. Soc. Biblical Archaeology, VIII, p. 165.

³"History of Art in Chaldea and Assyria," I, p. 200, fig. 71.

questionable whether the plain circle was continuously a representation of the sun in the Chaldean or Assyrian astronomy. It is also doubtful whether, if the circle did represent the sun, the insertion of the cross or the four wheel-like spokes necessarily gave the impression of "onward revolving motion;" or whether any or all of the foregoing afford a satisfactory basis for the origin of the Swastika or for its relation to, or representation of, the sun or the sun god.

Dr. Max Ohnefalsch-Richter¹ announces as his opinion that the Swastika in Cyprus had nearly always a signification more or less religious and sacred, though it may have been used as an ornament to fill empty spaces. He attributes to the *Croix swasticale*—or, as he calls it, *Croix cantonnée*—the equivalence of the solar disk, zigzag lightning, and double hatchet; while to the Swastika proper he attributes the signification of rain, storm, lightning, sun, light, seasons, and also that it lends itself easily to the solar disk, the fire wheel, and the sun chariot.

Greg² says:

Considered finally, it may be asked if the fylfot or gammadion was an early symbol of the sun, or, if only an emblem of the solar revolutions or movements across the heavens, why it was drawn square rather than curved: The , even if used in a solar sense, must have implied something more than, or something distinct from, the sun, whose proper and almost universal symbol was the circle. It was evidently more connected with the cross  than with the circle  or solar disk.

Dr. Brinton³ considers the Swastika as derived from the cross rather than from the circle, and the author agrees that this is probable, although it may be impossible of demonstration either way.

Several authors, among the rest d'Alviella, Greg, and Thomas, have announced the theory of the evolution of the Swastika, beginning with the triskelion, thence to the tetraskelion, and so to the Swastika. A slight examination is sufficient to overturn this hypothesis. In the first place, the triskelion, which is the foundation of this hypothesis, made its first appearance on the coins of Lycia. But this appearance was within what is called the first period of coinage, to wit, between 700 and 480 B. C., and it did not become settled until the second, and even the third period, 280 to 240 B. C., when it migrated to Sicily. But the Swastika had already appeared in Armenia, on the hill of Hissarlik, in the terramares of northern Italy, and on the hut-urns of southern Italy many hundred, possibly a thousand or more, years prior to that time. Count d'Alviella, in his plate 3. (see Chart I, p. 794), assigns it to a period of the fourteenth or thirteenth century B. C., with an unknown and indefinite past behind it. It is impossible that a symbol which first appeared in 480 B. C. could have been the ancestor of one which appeared in 1400 or 1300 B. C., nearly a thousand years before.

¹ Bull. Soc. d'Anthrop., Paris, 1888, pp. 674, 675.

² Archæologia, XLVIII, pt. 2, p. 326.

³ Proc. Amer. Philosoph. Soc., 1889, XXIX, p. 180.

William Simpson¹ makes observations upon the latest discoveries regarding the Swastika and gives his conclusion:

* * * The finding of the Swastika in America gives a very wide geographical space that is included by the problem connected with it, but it is wider still, for the Swastika is found over the most of the habitable world, almost literally "from China to Peru," and it can be traced back to a very early period. The latest idea formed regarding the Swastika is that it may be a form of the old wheel symbolism and that it represents a solar movement, or perhaps, in a wider sense, the whole celestial movement of the stars. The Dharmachakra, or Buddhist wheel, of which the so-called "praying wheel" of the Lamas of Thibet is only a variant, can now be shown to have represented the solar motion. It did not originate with the Buddhists; they borrowed it from the Brahminical system to the Veda, where it is called "the wheel of the sun." I have lately collected a large amount of evidence on this subject, being engaged in writing upon it, and the numerous passages from the old Brahminical authorities leave no doubt in the matter. The late Mr. Edward Thomas * * * and Prof. Percy Gardner * * * declared that on some Andhra gold coins and one from Mesembria, Greece, the part of the word which means day, or when the sun shines, is represented by the Swastika. These details will be found in a letter published in the "Athenæum" of August 20, 1892, written by Prof. Max Müller, who affirms that it "is decisive" as to the meaning of the symbol in Greece. This evidence may be "decisive" for India and Greece, but it does not make us quite certain about other parts of the world. Still it raises a strong presumption that its meaning is likely to be somewhat similar wherever the symbol is found.

It is now assumed that the Triskelion or Three Legs of the Isle of Man is only a variant of the Swastika. * * * There are many variants besides this in which the legs, or limbs, differ in number, and they may all be classed as whorls, and were possibly all, more or less, forms intended originally to express circular motion. As the subject is too extensive to be fully treated here, and many illustrations would be necessary, to those wishing for further details I would recommend a work just published entitled "The Migration of Symbols," by Count Goblet d'Alviella, with an introduction by Sir George Birdwood. The frontispiece of the book is a representation of Apollo, from a vase in the Kunsthistorisches Museum of Vienna, and on the middle of Apollo's breast there is a large and prominent Swastika. In this we have another instance going far to show its solar significance. While accepting these new interpretations of the symbol, I am still inclined to the notion that the Swastika may, at the same time, have been looked upon in some cases as a cross—that is, a pre-Christian cross, which now finds acceptance by some authorities as representing the four cardinal points. The importance of the cardinal points in primitive symbolism appears to me to have been very great, and has not as yet been fully realized. This is too large a matter to deal with here. All I can state is, that the wheel in India was connected with the title of a *Chakravartin*—from *Chakra*, a wheel—the title meaning a supreme ruler, or a universal monarch, who ruled the four quarters of the world, and on his coronation he had to drive his chariot, or wheel, to the four cardinal points to signify his conquest of them. Evidence of other ceremonies of the same kind in Europe can be produced. From instances such as these, I am inclined to assume that the Swastika, as a cross, represented the four quarters over which the solar power by its revolving motion carried its influence.

ORIGIN AND HABITAT.

Prehistoric archæologists have found in Europe many specimens of ornamental sculpture and engraving belonging to the Paleolithic age,

¹Quarterly Statement of the Palestine Exploration Fund, January, 1895, pp. 84, 85.

but the cross is not known in any form, Swastika or other. In the Neolithic age, which spread itself over nearly the entire world, with many geometric forms of decoration, no form of the cross appears in times of high antiquity as a symbol or as indicating any other than an ornamental purpose. In the age of bronze, however, the Swastika appears, intentionally used, as a symbol as well as an ornament. Whether its first appearance was in the Orient, and its spread thence throughout prehistoric Europe, or whether the reverse was true, may not now be determined with certainty. It is believed by some to be involved in that other warmly disputed and much-discussed question as to the locality of origin and the mode and routes of dispersion of Aryan peoples. There is evidence to show that it belongs to an earlier epoch than this, and relates to the similar problem concerning the locality of origin and the mode and routes of the dispersion of bronze. Was bronze discovered in eastern Asia and was its migration westward through Europe, or was it discovered on the Mediterranean, and its spread thence? The Swastika spread through the same countries as did the bronze, and there is every reason to believe them to have proceeded contemporaneously—whether at their beginning or not, is undeterminable.

The first appearance of the Swastika was apparently in the Orient, precisely in what country it is impossible to say, but probably in central and southeastern Asia among the forerunners or predecessors of the Bramins and Buddhists. At all events, a religious and symbolic significance was attributed to it by the earliest known peoples of these localities.

M. Michael Zmigrodzki, a Polish scholar, public librarian at Sucha, near Cracow, prepared and sent to the World's Columbian Exposition at Chicago a manuscript chart in French, showing his opinion of the migration of the Swastika, which was displayed in the Woman's Building. It was arranged in groups: The prehistoric (or Pagan) and Christian. These were divided geographically and with an attempt at chronology, as follows:

I. Prehistoric:

1. India and Bactria.
2. Cyprus, Rhodes.
3. North Europe.
4. Central Europe.
5. South Europe.
6. Asia Minor.
7. Greek and Roman epoch—Numismatics.

II. Christian:

8. Gaul—Numismatics.
9. Byzantine.
10. Merovingian and Carlovingian.
11. Germany.
12. Poland and Sweden.
13. Great Britain.

Lastly he introduces a group of the Swastika in the nineteenth century. He presented figures of Swastikas from these localities and

representing these epochs. He had a similar display at the Paris Exposition of 1889, which at its close was deposited in the St. Germain Pre-historic Museum. I met M. Zmigrodzki at the Tenth International Congress of Anthropology and Prehistoric Archæology in Paris, and heard him present the results of his investigations on the Swastika. I have since corresponded with him, and he has kindly sent me separates of his paper published in the *Archives für Ethnographie*, with 266 illustrations of the Swastika; but on asking his permission to use some of the information in the chart at Chicago, he informed me he had already given the manuscript chart and the right to reproduce it to the Chicago Folk-Lore Society. The secretary of this society declined to permit it to pass out of its possession, though proffering inspection of it in Chicago.

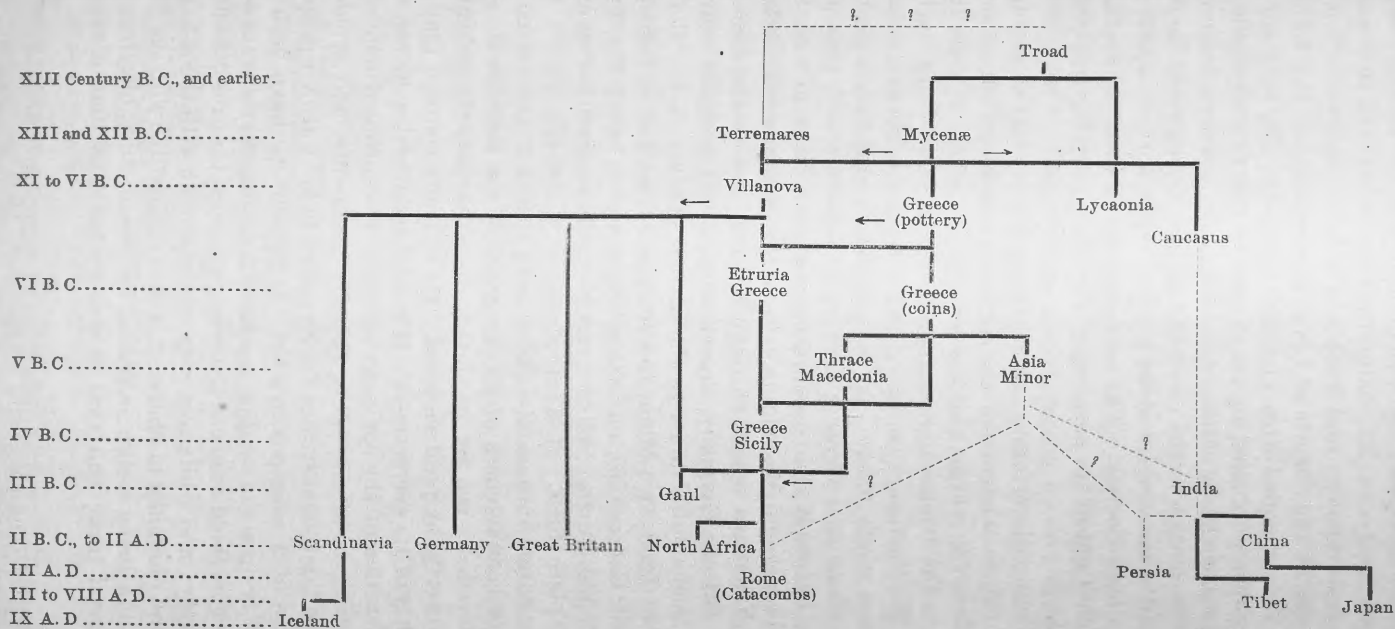
In his elaborate dissertation Count Goblet d'Alviella¹ shows an earlier and prehistoric existence of the Swastika before its appearance on the hill of Hissarlik. From this earlier place of origin it, according to him, spread to the Bronze age terramares of northern Italy. All this was prior to the thirteenth century B. C. From the hill of Hissarlik it spread east and west; to the east into Lycaonia and Caucasus, to the west into Mycenæ and Greece; first on the pottery and then on the coins. From Greece it also spread east and west; east to Asia Minor and west to Thrace and Macedonia. From the terramares he follows it through the Villanova epoch, through Etruria and Grand Greece, to Sicily, Gaul, Britain, Germany, Scandinavia, to all of which migration he assigns various dates down to the second century B. C. It developed westward from Asia Minor to northern Africa and to Rome, with evidence in the Catacombs; on the eastward it goes into India, Persia, China, Tibet, and Japan. All this can be made apparent upon examination of the plate itself. It is introduced as Chart I, p. 794.

The author enters into no discussion with Count d'Alviella over the correctness or completeness of the migrations set forth in his chart. It will be conceded, even by its author, to be largely theoretical and impossible to verify by positive proof. He will only contend that there is a probability of its correctness. It is doubted whether he can maintain his proposition of the constant presence or continued appearance of the Swastika on altars, idols, priestly vestments, and sepulchral urns, and that this demonstrates the Swastika to have always possessed the attributes of a religious symbol. It appears to have been used more frequently upon the smaller and more insignificant things of everyday life—the household utensils, the arms, weapons, the dress, the fibulæ, and the pottery; and while this may be consonant with the attributes of the talisman or amulet or charm, it is still compatible with the theory of the Swastika being a sign or symbol for benediction, blessing, good fortune, or good luck; and that it was rather this than a religious symbol.

¹ "La Migration des Symboles," pl. 3.

CHART I.—Probable introduction of the Swastika into different countries, according to Count Goblet d'Alviella.

[“La Migration des Symboles,” pl. 3.]



Count Goblet d'Alviella, in the fourth section of the second chapter¹ relating to the country of its origin, argues that the Swastika sign was employed by all the Aryans except the Persians. This omission he explains by showing that the Swastika in all other lands stood for the sun or for the sun-god, while the Aryans of Persia had other signs for the same thing—the *Cruz ansata* and the winged globe. His conclusion is² that there were two zones occupied with different symbols, the frontier between them being from Persia, through Cyprus, Rhodes, and Asia Minor, to Libya; that the first belonged to the Greek civilization, which employed the Swastika as a sun symbol; the second to the Egypto-Babylonian, which employed the *Cruz ansata* and the winged globe as sun symbols.

Professor Sayce, in his preface to "Troja," says:³

The same symbol [the Swastika], as is well known, occurs on the Archaic pottery of Cyprus * * * as well as upon the prehistoric antiquities of Athens and Mykênæ [same, "Ilios," p. 353], but it was entirely unknown to Babylonia, to Assyria, to Phœnicia, and to Egypt. It must therefore either have originated in Europe and spread eastward through Asia Minor or have been disseminated westward from the primitive home of the Hittites. The latter alternative is the more probable; but whether it is so or not, the presence of the symbol in the land of the Ægean indicates a particular epoch and the influence of a pre-Phœnician culture.

Dr. Schliemann⁴ reports that "Rev. W. Brown Keer observed the Swastika innumerable times in the most ancient Hindu temples, especially those of the Jainas."

Max Müller cites the following paragraph by Professor Sayce:⁵

It is evident to me that the sign found at Hissarlik is identical with that found at Mycænæ and Athens, as well as on the prehistoric pottery of Cyprus (Di Cesnola, Cyprus, pls. 44 and 47), since the general artistic character of the objects with which this sign is associated in Cyprus and Greece agrees with that of the objects discovered in Troy. The Cyprian vase [fig. 156, this paper] figured in Di Cesnola's "Cyprus," pl. 45, which associates the Swastika with the figure of an animal, is a striking analogue of the Trojan whorls, on which it is associated with the figure of the stags. The fact that it is drawn within the vulva of the leaden image on the Asiatic goddess shown in fig. 226 ("Ilios," fig. 125 this paper) seems to show that it was a symbol of generation.

Count Goblet d'Alviella,⁶ citing Albert Dumont⁷ and Perrot and Chipiez,⁸ says:

The Swastika appears in Greece, as well as in Cyprus and Rhodes, first on the pottery, with geometric decorations, which form the second period in Greek ceramics. From that it passes to a later period, where the decoration is more artistic and the appearance of which coincides with the development of the Phœnician influences on the coasts of Greece.

Dr. Ohnefalsch-Richter, in a paper devoted to the consideration of

¹ "La Migration des Symboles," p. 93.

² Ibid., p. 107.

³ "Ilios," p. xxi."

⁴ Ibid, p. 352.

⁵ Ibid, p. 353.

⁶ "La Migration des Symboles," p. 43.

⁷ "Peintures céramiques de la Grèce propre," I, pl. xv, fig. 17.

⁸ "Histoire de l'art dans l'antiquité," III, figs. 513, 515, 518.

the Swastika in Cyprus,¹ expresses the opinion that the emigrant or commercial Phenicians traveling in far eastern countries brought the Swastika by the sea route of the Persian Gulf to Asia Minor and Cyprus, while, possibly, other people brought it by the overland route from central Asia, Asia Minor, and Hissarlik, and afterwards by migration to Cyprus, Carthage, and the north of Africa.

Professor Goodyear says:²

The true home of the Swastika is the Greek geometric style, as will be immediately obvious to every expert who examines the question through the study of that style. In seeking the home of a symbol, we should consider where it appears in the largest dimension and where it appears in the most formal and prominent way. The Greek geometric vases are the only monuments on which the Swastika systematically appears in panels exclusively assigned to it (pl. 60, fig. 13; and pl. 56, fig. 4). There are no other monuments on which the Swastika can be found in a dimension taking up one-half the height of the entire object (pl. 56, fig. 4). The ordinary size of the Swastika, in very primitive times, is under a third of an inch in diameter. They are found in Greek geometric pottery 2 or 3 inches in diameter, but they also appear in the informal scattering way (pl. 61, fig. 4) which characterizes the Swastika in other styles.

* * * * *
The Swastika dates from the earliest diffusion of the Egyptian meander in the basin of the Mediterranean, and it is a profound remark of De Morgan (Mission Scientifique au Caucase) that the area of the Swastika appears to be coextensive with the area of bronze. In northern prehistoric Europe, where the Swastika has attracted considerable attention, it is distinctly connected with the bronze culture derived from the south. When found on prehistoric pottery of the north, the southern home of its beginnings is equally clear.

In seeking the home of a symbol, we should consider not only the nature of its appearance, but also where it is found in the largest amount, for this shows the center of vogue and power—that is to say, the center of diffusion. The vogue of the Swastika at Troy is not as great as its vogue in Cyprian Greek pottery (pl. 60, fig. 15) and Rhodian pottery (pl. 60, fig. 2). * * * It is well known to Melian vases (pl. 60, fig. 8) and to archaic Greek vases (pl. 61, fig. 12), but its greatest prominence is on the pottery of the Greek geometric style (pl. 60, fig. 13; pl. 56, fig. 4; pl. 61, figs. 1 and 4; and figs. 173 and 174). * * *

Aside from the Greek geometric style, our earliest reference for the Swastika, and very possibly an earlier reference than the first, is its appearance on the "hut urns" of Italy. On such it appears rather as a fragment of the more complicated meander patterns, from which it is derived. My precise view is that the earliest and, consequently, imperfect, forms of the Swastika are on the hut urns of Italy, but that, as an independent and definitely shaped pattern, it first belongs to the Greek geometric style. I do not assert that the Swastika is very common on hut urns, which are often undecorated. * * * Our present intermediate link with India for the Swastika lies in the Caucasus and in the adjacent territory of Koban. This last ancient center of the arts in metal has lately attracted attention through the publication of Virchow (Das Gräberfeld von Koban). In the original Coban bronzes of the Prehistoric Museum of St. Germain there is abundant matter for study (p. 351).

Mr. R. P. Greg, in "Fret or Key Ornamentation in Mexico and Peru,"³ says:

Both the Greek fret and the fylfot appear to have been unknown to the Semitic nations as an ornament or as a symbol.

¹ Bull. Soc. d'Anthrop., Paris, December 6, 1888, pp. 669, 679, 680.

² "Grammar of the Lotus," p. 348 et seq.

³ Archæologia, XLVII, pt. 1, p. 159.

In Egypt the fylfot does not occur. It is, I believe, generally admitted or supposed that the fylfot is of early Aryan origin. Eastward toward India, Tibet, and China it was adopted, in all probability, as a sacred symbol of Buddha; westward it may have spread in one form or another to Greece, Asia Minor, and even to North Germany.

Cartailhac says:¹

Modern Christian archæologists have obstinately contended that the Swastika was composed of four gamma, and so have called it the *Croix Gammée*. But the Ramáyana placed it on the boat of the Rama long before they had any knowledge of Greek. It is found on a number of Buddhist edifices; the Sectarians of Vishnu placed it as a sign upon their foreheads. Burnouf says it is the Aryan sign par excellence. It was surely a religious emblem in use in India fifteen centuries before the Christian era, and thence it spread to every part. In Europe it appeared about the middle of the civilization of the bronze age, and we find it, pure or transformed into a cross, on a mass of objects in metal or pottery during the first age of iron. Sometimes its lines were rounded and given a graceful curve instead of straight and square at its ends and angles. [See letter by Gandhi, pp. 803, 805.]

M. Cartailhac notes² several facts concerning the associations of the Swastika found by him in Spain and Portugal and belonging to the first (prehistoric) age of iron: (1) The Swastika was associated with the silhouettes of the duck or bird, similar to those in Greece, noted by Goodyear; (2) the association (in his fig. 41) on a slab from the lake dwellings, of the Maltese cross and reproduction of the triskelion; (3) a tetraskelion, which he calls a Swastika "flamboyant," being the triskelion, but with four arms, the same shown on Lycian coins as being ancestors of the true triskelion (his fig. 412); (4) those objects were principally found in the ancient lake dwellings of Sambroso and Briteiros; supposedly dating from the eighth and ninth centuries B. C. With them were found many ornaments, borders representing cords, spirals, meanders, etc., which had the same appearance as those found by Schliemann at Mycenæ. Cartailhac says:³

Without doubt Asiatic influences are evident in both cases; first appearing in the Troad, then in Greece, they were spread through Iberia and, possibly, who can tell, finally planted in a far-away Occident.

A writer in the *Edinburgh Review*, in an extended discussion on "The pre-Christian cross," treats of the Swastika under the local name of "Fylfot," but in such an enigmatical and uncertain manner that it is difficult to distinguish it from other and commoner forms of the cross. Mr. Waring⁴ criticises him somewhat severely for his errors:

He states that it is found * * * in the sculptured stones of Scotland (but after careful search we can find only one or two imperfect representations of it, putting aside the Newton stone inscription, where it is probably a letter or numeral only); that it is carved on the temples and other edifices of Mexico and Central America (where again we have sought for it in vain); that it is found on the cinerary urns of the terramare of Parma and Vicenza, the date of which has been assigned by Italian antiquaries to 1000 B. C. (but there again we have found only the plain

¹ "Ages Préhistorique de l'Espagne et du Portugal," pp. 285-293.

² *Ibid.*, p. 286.

³ *Ibid.*, p. 293.

⁴ "Ceramic Art in Remote Ages," p. 13.

cross, and not the fylfot), and, finally, he asserts that "it was the emblem of Libitina or Persephone, the awful Queen of the Shades, and is therefore commonly found on the dress of the tumulorum fossor in the Roman catacombs," but we have only found one such example. "It is noteworthy, too," he continues, "in reference to its extreme popularity, or the superstitious veneration in which it has been also universally held, that the cross pattée, or cruciform hammer (but we shall show these are different symbols), was among the very last of purely pagan symbols which was religiously preserved in Europe long after the establishment of Christianity (not in Europe, but in Scandinavia and wherever the Scandinavians had penetrated). * * * It may be seen upon the bells of many of our parish churches, as at Appleby, Mexborough, Haythersaye, Waddington, Bishop's Norton, West Barkwith, and other places, where it was placed as a magical sign to subdue the vicious spirit of the tempest;" and he subsequently points out its constant use in relation to water or rain.

Mr. Waring continues:

The Rev. C. Boutell, in "Notes and Queries," points out that it is to be found on many mediæval monuments and bells, and occurs—e. g., at Appleby in Lincolnshire (peopled by Northmen)—as an initial cross to the formula on the bell "Sta. Maria, o. p. n. and c." In these cases it has clearly been adopted as a Christian symbol. In the same author's "Heraldry," he merely describes it as a mystic cross.

Mr. Waring makes one statement which, being within his jurisdiction, should be given full credit. He says, on page 15:

It [the Swastika] appears in Scotland and England only in those parts where Scandinavians penetrated and settled, but is not once found in any works of purely Irish or Franco-Celtic art.

He qualifies this, however, by a note:

I believe it occurs twice on an "Ogam" stone in the Museum of the Royal Irish Academy, figured in Wilde's Catalogue (p. 136), but the fylfots are omitted in the wood cut. [See fig. 215.]

Dr. Brinton,¹ describing the normal Swastika, "with four arms of equal length, the hook usually pointing from left to right," says: "In this form it occurs in India and on very early (Neolithic) Grecian, Italic, and Iberian remains." Dr. Brinton is the only author who, writing at length or in a critical manner, attributes the Swastika to the Neolithic period in Europe, and in this, more than likely, he is correct. Professor Virchow's opinion as to the antiquity of the hill of Hissarlik, wherein Dr. Schliemann found so many Swastikas, should be considered in this connection. (See p. 832, 833 of this paper.) Of course, its appearance among the aborigines of America, we can imagine, must have been within the Neolithic period.

¹Proc. Amer. Philosoph. Soc., 1889, xxix, p. 179.

II.—DISPERSION OF THE SWASTIKA.

EXTREME ORIENT.

JAPAN.

The Swastika was in use in Japan in ancient as well as modern times. Fig. 29 represents a bronze statue of Buddha, one-fifteenth natural size, from Japan, in the collection of M. Cernuschi, Paris. It has eight Swastikas on the pedestal, the ends all turned at right angles to the right. This specimen is shown by De Mortillet¹ because it relates to prehistoric man. The image or statue holds a cane in the form of a "tintinnabulum," with movable rings arranged to make a jingling noise, and De Mortillet inserted it in his volume to show the likeness of this work in Japan with a number of similar objects found in the Swiss lake dwellings in the prehistoric age of bronze (p. 806).

The Swastika mark was employed by the Japanese on their porcelain. Sir Augustus W. Franks² shows one of these marks, a small Swastika turned to the left and inclosed in a circle (fig. 30). Fig. 9 also represents a mark on Japanese bronzes.³

KOREA.

The U. S. National Museum has a ladies' sedan or carrying chair from Korea. It bears eight Swastika marks, cut by stencil in the brass-bound corners, two on each corner, one looking each way. The Swastika is normal, with arms crossing at right angles, the ends bent at right angles and to the right. It is quite plain; the lines are all straight, heavy, of equal thickness, and the angles all at 90 degrees. In appearance it resembles the Swastika in fig. 9.



Fig. 30.

JAPANESE POT-
TER'S MARK ON
PORCELAIN.

De Mortillet, "Mu-
sée Préhistorique,"
fig. 1248.



Fig. 29.

BRONZE STATUE OF BUDDHA.

Japan.

Eight Swastikas on pedestal. Cane tintinnabulum with six movable rings or bells.

One fifteenth natural size.

CHINA.

In the Chinese language the sign of the Swastika is pronounced *wan* (p. 801), and stands for "many," "a great number," "ten thousand," "infinity," and by a synecdoche is construed to mean "long

¹ "Musée Préhistorique," fig. 1230; Bull. Soc. d'Anthrop., Paris., 1886, pp. 299, 313, 314.

² "Catalogue of Oriental Porcelain and Pottery," pl. 11, fig. 139.

³ De Morgan, "Au Caucase," fig. 180.

life, a multitude of blessings, great happiness," etc.; as is said in French, "mille pardons," "mille remerciements," a thousand thanks, etc. During a visit to the Chinese legation in the city of Washington, while this paper was in progress, the author met one of the attachés, Mr. Chung, dressed in his robes of state; his outer garment was of moiré silk. The pattern woven in the fabric consisted of a large circle with certain marks therein, prominent among which were two Swastikas, one turned to the right, the other to the left. The name given to the sign was as reported above, wan, and the signification was "longevity," "long life," "many years." Thus was shown that in far as well as near countries, in modern as well as ancient times, this sign stood for blessing, good wishes, and, by a slight extension, for good luck.



The author conferred with the Chinese minister, Yang Yu, with the request that he should furnish any appropriate information concerning the Swastika in China. In due course the author received the following letter and accompanying notes with drawings:





* * * I have the pleasure to submit abstracts from historical and literary works on the origin of the Swastika in China and the circumstances connected with it in Chinese ancient history. I have had this paper translated into English and illustrated by india-ink drawings. The Chinese copy is made by Mr. Ho Yen-Shing, the first secretary of the legation, translation by Mr. Chung, and drawings by Mr. Li.

With assurance of my high esteem, I am,

Very cordially,

YANG YU.

Buddhist philosophers consider simple characters as half or incomplete characters and compound characters as complete characters, while the Swastika  is regarded as a natural formation. A Buddhist priest of the Tang Dynasty, Tao Shih by name, in a chapter of his work entitled Fa Yuen Chu Lin, on the original Buddha, describes him as having this  mark on his breast and sitting on a high lily of innumerable petals. [Pl. 1.]

Empress Wu (684-704 A. D.), of the Tang Dynasty, invented a number of new forms for characters already in existence, amongst which  was the word for sun,  for moon,  for star, and so on. These characters were once very extensively used in ornamental writing; and even now the word  sun may be found in many of the famous stone inscriptions of that age, which have been preserved to us up to the present day. [Pl. 2.]

The history of the Tang Dynasty (620-906 A. D.), by Lni Hsu and others of the Tsin Dynasty, records a decree issued by Emperor Tai Tsung (763-779 A. D.) forbidding the use of the Swastika on silk fabrics manufactured for any purpose. [Pl. 3.]

Fung Tse, of the Tang Dynasty, records a practice among the people of Loh-yang to endeavor, on the 7th of the 7th month of each year, to obtain spiders to weave the Swastika on their web. Kung Ping-Chung, of the Sung Dynasty, says that the people of Loh-yang believe it to be good luck to find the Swastika woven by spiders over fruits or melons. [Pl. 4.]

Sung Pai, of the Sung Dynasty, records an offering made to the Emperor by Li Yuen-su, a high official of the Tang Dynasty, of a buffalo with a Swastika on the forehead, in return for which offering he was given a horse by the Emperor. [Pl. 5.]

The Ta'ing-I-Luh, by Tao Kuh, of the Sung Dynasty, records that an Empress in



ORIGIN OF BUDDHA ACCORDING TO TAO SHIH, WITH SWASTIKA SIGN.

From a drawing by Mr. Li, presented to the U. S. National Museum by Mr. Yang Yü, Chinese Minister, Washington, D. C.

唐武后借佛大周天冊金輪神聖皇帝自
 造文字日為☉月為☽星為○當時馮
 善廓造浮圖銘法門寺碑涅槃經信法
 寺碑潘尊師碣獲嘉縣浮圖銘王仁
 求碑梁師亮墓誌銘小石橋碑岱岳觀
 碑凡日字皆作☉形



SWASTIKA DECREED BY EMPRESS WU (684-704 A. D.) AS A SIGN FOR SUN IN CHINA.

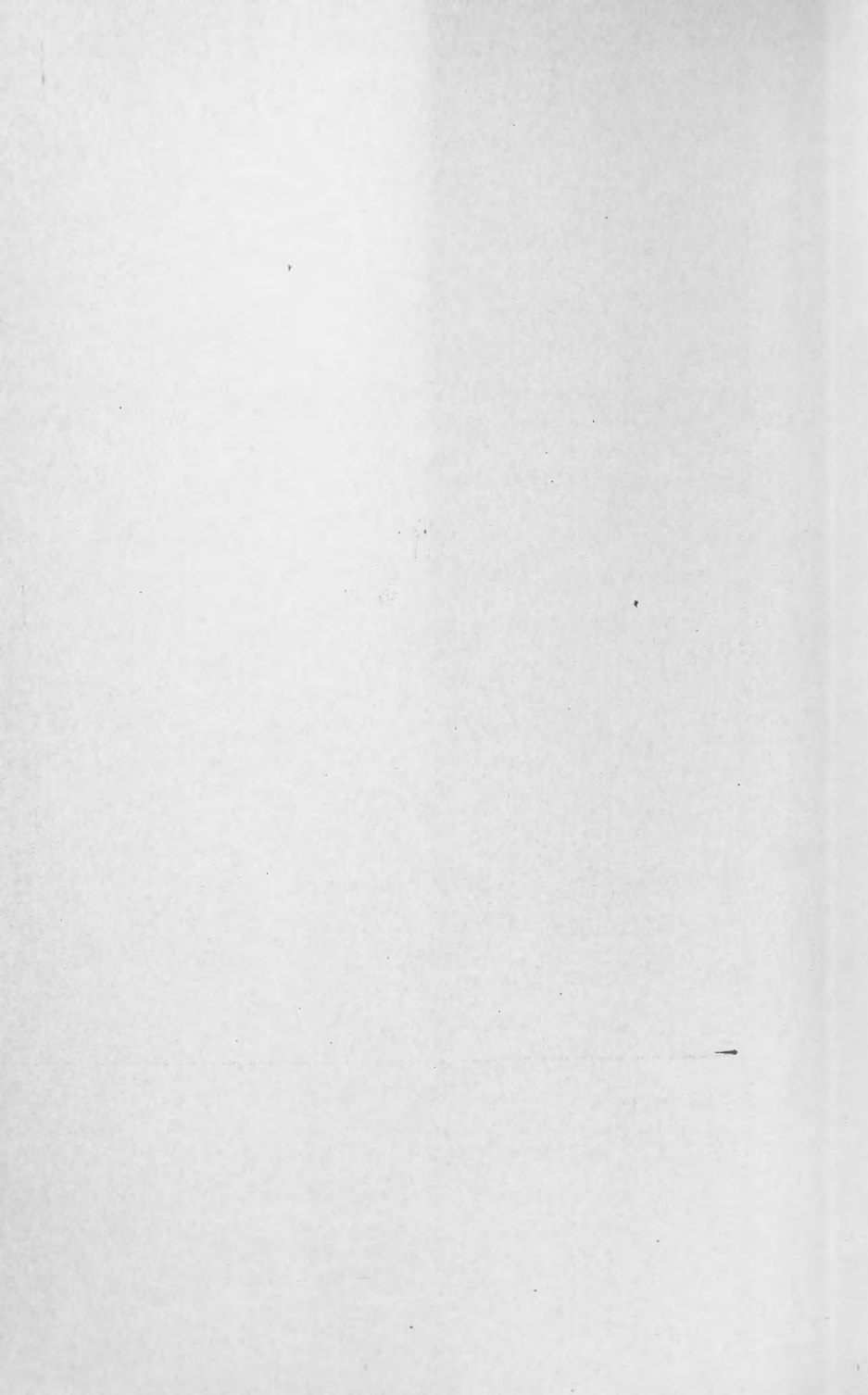
From a drawing by Mr. Li, presented to the U. S. National Museum by Mr. Yang Yü, Chinese Minister, Washington, D. C.

晉劉昫等舊唐書代宗紀
 丙寅詔云綾錦
 所織萬字萬即雙勝
 並宜禁斷



SWASTIKA DESIGN ON SILK FABRICS.

This use of the Swastika was forbidden in China by Emperor Tai Tsung (763-779 A. D.).
 From a drawing by Mr. Li, presented to the U. S. National Museum by Mr. Yang Yü, Chinese
 Minister, Washington, D. C.





SWASTIKA IN SPIDER WEB OVER FRUIT.

(A good omen in China.)

From a drawing by Mr. Li, presented to the U. S. National Museum by Mr. Yang Yü, Chinese Minister, Washington, D. C.

宋宋曰文苑英華唐鳳閣侍郎李元素
 進拍牛一頭額上青萬字
 李燾代為表
萬即賜馬一匹



BUFFALO WITH SWASTIKA ON FOREHEAD.

Presented to Emperor of Sung Dynasty.

From a drawing by Mr. Li, presented to the U. S. National Museum by Mr. Yang Yü, Chinese Minister, Washington, D. C.

宋陶穀清異錄南唐李煜長秋周氏居
柔儀殿其焚香之器有卍字



INCENSE BURNER WITH SWASTIKA DECORATION.

South Tang Dynasty.

From a drawing by Mr. Li, presented to the U. S. National Museum by Mr. Yang Yü, Chinese Minister, Washington D. C.

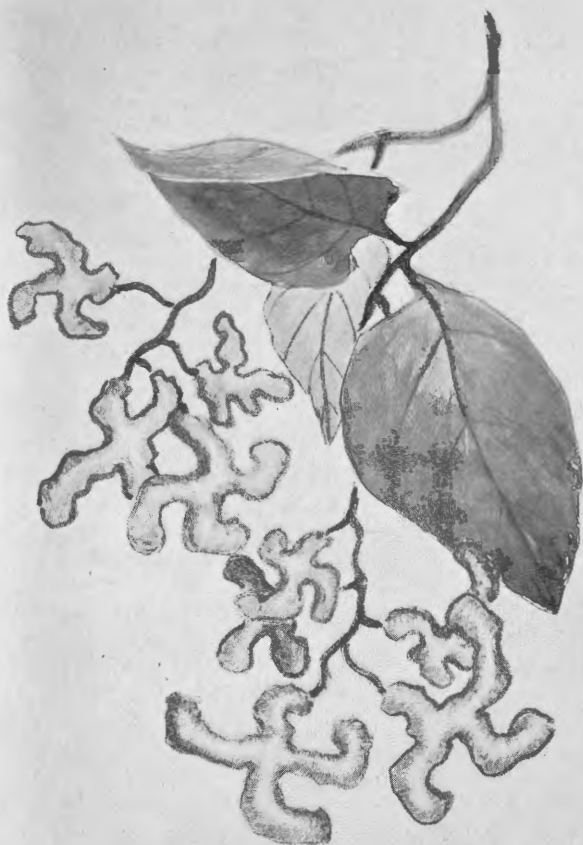
朱彝尊明詩綜秀水處士吳總持育
 大宅在北郭之秋涇取方廣甬前字曰
 為曲闌名曰正齋



HOUSE OF WU TSUNG-CHIH OF SIN SHUI, WITH SWASTIKA IN RAILING

From a drawing by Mr. Li, presented to the U. S. National Museum by Mr. Yang Yü, Chinese Minister, Washington, D. C.

閩名東西洋攷山棗子葉似梅子如荔支九
月熟果作卍字形畫甚方



MOUNTAIN OR WILD DATE.—FRUIT RESEMBLING THE SWASTIKA.

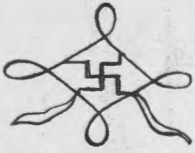
From a drawing by Mr. Li, presented to the U. S. National Museum by Mr. Yang Yü, Chinese Minister, Washington, D. C.

the time of the South Tang Dynasty had an incense burner the external decoration of which had the Swastika design on it. [Pl. 6.]

Chu I-Tsu, in his work entitled *Ming Shih Tsung*, says Wu Tsung-Chih, a learned man of Sin Shui, built a residence outside of the north gate of that town, which he named "Wan-Chai," from the Swastika decoration of the railings about the exterior of the house. [Pl. 7.]

An anonymous work, entitled the *Tung Hsi Yang K'ao*, described a fruit called shan-tsoo-tse (mountain or wild date), whose leaves resemble those of the plum. The seed resembles the lichee, and the fruit, which ripens in the ninth month of the year, suggests a resemblance to the Swastika. [Pl. 8.]

The Swastika is one of the symbolic marks of the Chinese porcelain. Prime¹ shows what he calls a "tablet of honor," which represents a Swastika inclosed in a lozenge with loops at the corners (fig. 31). This mark on a piece of porcelain signifies that it is an imperial gift.

Major-General Gordon, controller of the Royal Arsenal at Woolwich, England, writes to Dr. Schliemann:² "The Swastika is Chinese. On the breech chasing of a large gun lying outside my office, captured in the Taku fort, you will find this same sign." But Dumoutier³ says this sign is nothing else than the ancient Chinese character *che*, which, according to D'Alviella,⁴ carries the idea of perfection or excellence, and signifies the renewal and perpetuity of life. And again,² "Dr. Lockyer, formerly medical missionary to China, says the sign  is thoroughly Chinese."

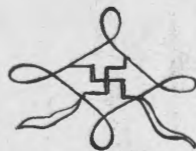


Fig. 31.

POTTER'S MARK ON PORCELAIN.
China.

Tablet of honor, with Swastika.
Prime, "Pottery and Porcelain," p. 254.

The Swastika is found on Chinese musical instruments. The U. S. National Museum possesses a Hu-Ch'in, a violin with four strings, the body of which is a section of bamboo about 3½ inches in diameter. The septum of the joint has been cut away so as to leave a Swastika of normal form, the four arms of which are connected with the outer walls of the bamboo. Another, a Ti-Ch'in, a two-stringed violin, with a body of cocoon, has a carving which is believed to have been a Swastika; but the central part has been broken out, so that the actual form is undetermined.

Prof. George Frederick Wright, in an article entitled "Swastika,"⁵ quotes Rev. F. H. Chalfont, missionary at Chanting, China, as saying: "Same symbol in Chinese characters 'ouan,' or 'wan,' and is a favorite ornament with the Chinese."

¹ "Pottery and Porcelain," p. 254.

² "Ilios," p. 352.

³ "Le Swastika et la roue solaire en Chine," *Revue d'Ethnographie*, IV, pp. 319, 350.

⁴ "La Migration des Symboles," p. 55.

⁵ *New York Independent*, November 16, 1893; *Science*, March 23, 1894, p. 162.

TIBET.

Mr. William Woodville Rockhill,¹ speaking of the fair at Kumbum, says:

I found there a number of Lh'asa Tibetans (they call them Gopa here) selling pulo, beads of various colors, saffron, medicines, peacock feathers, incense sticks, etc. I had a talk with these traders, several of whom I had met here before in 1889. * * * One of them had a Swastika (yung-drung) tattooed on his hand, and I learned from this man that this is not an uncommon mode of ornamentation in his country.

Count D'Alviella says that the Swastika is continued among the Buddhists of Tibet; that the women ornament their petticoats with it, and that it is also placed upon the breasts of their dead.²

He also reports³ a Buddhist statue at the Musée Guimet with Swastikas about the base. He does not state to what country it belongs, so the author has no means of determining if it is the same statue as is represented in fig. 29.



Fig. 32.

FOOTPRINT OF BUDDHA WITH SWASTIKA, FROM AMARAVATI TOPE.

From a figure by Fergusson and Schlegelmann.

INDIA.

Burnouf⁴ says approvingly of the Swastika:

Christian archæologists believe this was the most ancient sign of the cross. * * * It was used among the Brahmins from all antiquity. (Voyez mot "Swastika" dans notre dictionnaire sanskrit.) Swastika, or Swasta, in India corresponds to "benediction" among Christians.

The same author, in his translation of the "Lotus de la Bonne Loi," one of the nine Dharmas or Canonical books of the Buddhists of the North, of 280 pages, adds an appendix of his own writing of 583 pages; and in one (No. 8) devoted to an enumeration and description of the sixty-five figures traced on the footprint of Çakya (fig. 32) commences as follows:


1. *Swastikaya*: This is the familiar mystic figure of many Indian sects, represented

¹ "Diary of a Journey through Mongolia and Tibet in 1891-92," p. 67.

² "La Migration des Symboles," p. 55, citing note I, Journ. Asiatique, 2^e série, IV, p. 245, and Pallas, "Sammlungen historischer Nachrichten über die mongolischen Völkerschaften," I, p. 277.

³ Ibid., p. 55.

⁴ "Des Sciences et Religion," p. 256.

thus, , and whose name signifies, literally, "sign of benediction or of good augury." (Rgya teh'er rol pa, Vol. 11, p. 110.)

* * * The sign of the Swastika was not less known to the Brahmins than to the Buddhists. "Ramayana," Vol. II, p. 348, ed. Gor., Chap. XCVII, st. 17, tells of vessels on the sea bearing this sign of fortune. This mark, of which the name and usage are certainly ancient, because it is found on the oldest Buddhist medals, may have been used as frequently among the Brahmins as among the Buddhists. Most of the inscriptions on the Buddhist caverns in western India are either preceded or followed by the holy (*sacramentelle*) sign of the Swastika. It appears less common on the Brahmin monuments.

Mr. W. Crooke (Bengal Civil Service, director of Eth. Survey, North-west Provinces and Oudh), says: ¹

The mystical emblem of the Swastika, which appears to represent the sun in his journey through the heavens, is of constant occurrence. The trader paints it on the flyleaf of his ledger, he who has young children or animals liable to the evil eye makes a representation of it on the wall beside his doorpost. It holds first place among the lucky marks of the Jainas. It is drawn on the shaven heads of children on the marriage day in Gujarat. A red circle with Swastika in the center is depicted on the place where the family gods are kept (Campbell, Notes, p. 70). In the Meerut division the worshiper of the village god Bhumiya constructs a rude model of it in the shrine by fixing up two crossed straws with a daub of plaster. It often occurs in folklore. In the drama of the Toy Cart the thief hesitates whether he shall make a hole in the wall of Charudatta's house in the form of a Swastika or of a water jar (Manning, Ancient India, 11, 160).

Village shrines.—The outside (of the shrines) is often covered with rude representations of the mystical Swastika.

On page 250 he continues thus:

Charms.—The bazar merchant writes the words "Ram Ram" over his door, or makes an image of Genesa, the god of luck, or draws the mystical Swastika. The jand tree is revered as sacred by Khatris and Brahmins to avoid the evil eye in children. The child is brought at 3 years of age before a jand tree; a bough is cut with a sickle and planted at the foot of the tree. A Swastika symbol is made before it with the rice flour and sugar brought as an offering to the tree. Threads of string, used by women to tie up their hair, are cut in lengths and some deposited on the Swastika.

Mr. Virchand R. Gandhi, a Hindu and Jain disciple from Bombay, India, a delegate to the World's Parliament of Religions at Chicago in 1893, remained for sometime in Washington, D. C., proselyting among the Christians. He is a cultivated gentleman, devoted to the spread of his religion. I asked his advice and assistance, which he kindly gave, supervising my manuscript for the Swastika in the extreme Orient, and furnishing me the following additional information relative to the Swastika in India, and especially among the Jains:

The Swastika is misinterpreted by so-called Western expounders of our ancient Jain philosophy. The original idea was very high, but later on some persons thought the cross represented only the combination of the male and the female principles. While we are on the physical plane and our propensities on the material line, we think it necessary to unite these (sexual) principles for our spiritual growth. On

¹ "Introduction to Popular Religion and Folk Lore of North India," p. 58.

the higher plane the soul is sexless, and those who wish to rise higher than the physical plane must eliminate the idea of sex.

I explain the Jain Swastika by the following illustration [fig. 33]: The horizontal and vertical lines crossing each other at right angles form the Greek cross. They represent spirit and matter. We add four other lines by bending to the right each arm of the cross, then three circles and the crescent, and a circle within the crescent. The idea thus symbolized is that there are four grades of existence of souls in the material universe. The first is the lowest state—Archaic or protoplasmic life. The soul evolves from that state to the next—the earth with its plant and animal life. Then follows the third stage—the human; then the fourth stage—the celestial. The word “celestial” is here held to mean life in other worlds than our own. All these graduations are combinations of matter and soul on different scales. The spiritual plane is that in which the soul is entirely freed from the bonds of matter. In order to reach that plane, one must strive to possess the three jewels (represented by the three circles), right belief, right knowledge, right conduct. When a person has these, he will certainly go higher until he reaches the state of liberation, which is represented by the crescent. The crescent has the form of the rising moon and is always growing larger. The circle in the crescent represents the omniscient state of the

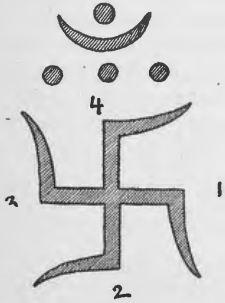


Fig. 33.

EXPLANATION OF THE JAIN SWASTIKA, ACCORDING TO GANDHI.

- (1) Archaic or protoplasmic life; (2) Plant and animal life; (3) Human life; (4) Celestial life.

the soul when it has attained full consciousness, is liberated, and lives apart from matter.

The interpretation, according to the Jain view of the cross, has nothing to do with the combination of the male and female principle. Worship of the male and female principles, ideas based upon sex, lowest even of the emotional plane, can never rise higher than the male and female.

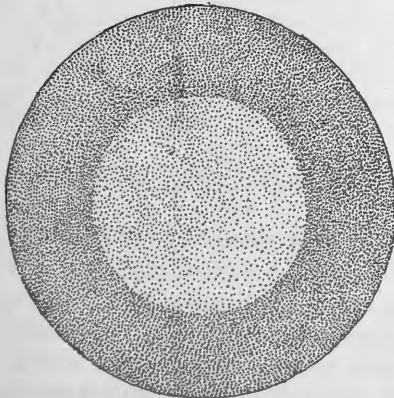


Fig. 34a.

THE FORMATION OF THE JAIN SWASTIKA—FIRST STAGE.

Handful of rice or meal, in circular form, thinner in center.

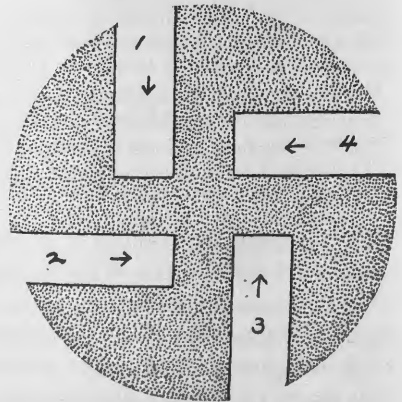


Fig. 34b.

THE FORMATION OF THE JAIN SWASTIKA—SECOND STAGE.

Rice or meal, as shown in preceding figure, with finger marks, indicated at 1, 2, 3, 4.

The Jains make the Swastika sign when we enter our temple of worship. This sign reminds us of the great principles represented by the three jewels and by which we are to reach the ultimate good. Those symbols intensify our thoughts and make them more permanent.

Mr. Gandhi says the Jains make the sign of the Swastika as frequently and deftly as the Roman Catholics make the sign of the cross. It is not confined to the temple nor to the priests or monks. Whenever or wherever a benediction or blessing is given, the Swastika is used. Figs. 34 *a, b, c* form a series showing how it is made. A handful of rice, meal, flour, sugar, salt, or any similar substance, is spread over a circular space, say, 3 inches in diameter and one-eighth of an inch deep (fig. 34*a*), then commence at the outside of the circle (fig. 34*b*), on its upper or farther left-hand corner, and draw the finger through the meal just to the left of the center, halfway or more to the opposite or near edge of the circle (1), then again to the right (2), then upward (3), finally

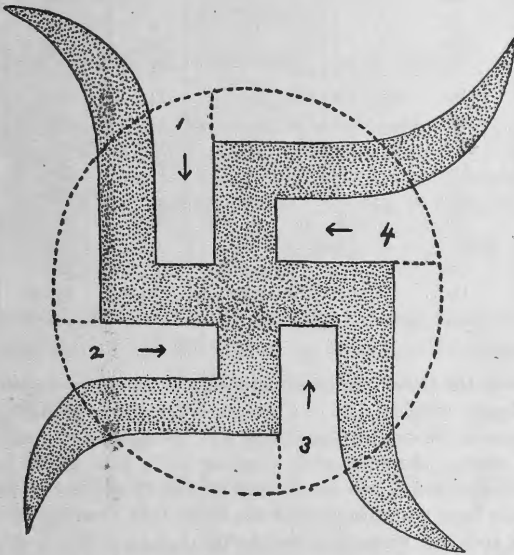


Fig. 34c.

THE FORMATION OF THE JAIN SWASTIKA—THIRD STAGE.

Ends turned out, typifying animal, human, and celestial life, as shown in fig. 33.

to the left where it joins with the first mark (4). The ends are swept outward, the dots and crescent put in above, and the sign is complete (fig. 34*c*).

The sign of the Swastika is reported in great numbers, by hundreds if not by thousands, in the inscriptions on the rock walls of the Buddhist caves in India. It is needless to copy them, but is enough to say that they are the same size as the letters forming the inscription; that they all have four arms and the ends turn at right angles, or nearly so, indifferently to the right or to the left. The following list of inscriptions, containing the Swastikas, is taken from the first book coming to hand—the “Report of Dr. James Burgess on the Buddhist Cave Temples and their Inscriptions, Being a Part of the Result of the Fourth,

Fifth, and Sixth Seasons' Operations of the Archæological Survey of Western India, 1876, 1877, 1878, 1879:"¹

	Plate.	Inscription number.	Direction in which ends are bent.
Bhaja.....	XLIV	2	To right.
Kuda.....	XLVI	26	Do.
Do.....	XLVI	27	To left.
Kol.....	XLVI	5	To right.
Karle.....	XLVII	1	Do.
Do.....	XLVII	3	Do.
Junnar.....	XLIX	5	Do.
Do.....	XLIX	6	To left.
Do.....	XLIX	7	To right.
Do.....	XLIX	8	To left.
Do.....	XLIX	9	To right.
Do.....	XLIX	10	Do.
Do.....	YLIX	11 (?)	Do.
Do.....	XLIX	12	Do.
Do.....	XLIX	13 (?)	Do.
Do.....	XLIX	13 (?)	To left.
Do.....	XLIX	14	Do.
Do.....	L	17	To right.
Do.....	L	19	Do.
Nasik.....	LII.....	5	Do.
Do.....	LV (Nasik 21)	5 (?)	Do.
Do.....	LV (Nasik 24)	8 (?)	Do.

Chantre² says:

I remind you that the (East) Indians, Chinese, and Japanese employ the Swastika, not only as a religious emblem but as a simple ornament in painting on pottery and elsewhere, the same as we employ the Greek fret, lozenges, and similar motifs in our ornamentation. *Sistres* [the staff with jingling bells, held in the hand of Buddha, on whose base is engraved a row of Swastikas, fig. 29 of present paper] of similar form and style have been found in prehistoric Swiss lake dwellings of the bronze age. Thus the *sistres* and the Swastika are brought into relation with each other. The *sistres* possibly relate to an ancient religion, as they did in the Orient; the Swastika may have had a similar distinction.

De Mortillet and others hold the same opinion.³

CLASSICAL ORIENT.

BABYLONIA, ASSYRIA, CHALDEA, AND PERSIA.

Waring⁴ says, "In Babylonian and Assyrian remains we search for it [the Swastika] in vain." Max Müller and Count Goblet d'Alviella are of the same opinion.⁵

¹Trubner & Co., London, 1883, pp. 140, pl. 60.

²"*Âge du Bronze*," pt. 1, p. 206.

³"*Musée Préhistorique*," pl. 98; "Notes de l'Origine Orientale de la Métallurgie," Lyon, 1879; "L'Âge de la Pierre et du Bronze dans l'Asie Occidentale," Bull. Soc. d'Anthrop., Lyon, 1, fasc. 2, 1882; Bull. Soc. d'Anthrop. de Paris, 1886, pp. 299, 313, and 314.

⁴"*Ceramic Art in Remote Ages*."

⁵"*La Migration des Symboles*," pp. 51, 52.

Of Persia, D'Alviella (p. 51), citing Ludwig Müller,¹ says that the Swastika is manifested only by its presence on certain coins of the Arsacides and the Sassanides.

PHENICIA.

It is reported by various authors that the Swastika has never been found in Phenicia, e. g. Max Müller, J. B. Waring, Count Goblet d'Alviella.²

Ohnefalsch-Richter³ says that the Swastika is not found in Phenicia, yet he is of the opinion that their emigrant and commercial travelers brought it from the far east and introduced it into Cyprus, Carthage, and the north of Africa. (See p. 796.)

LYCAONIA.

Lempriere, in his Classical Dictionary, under the above title, gives the following:

A district of Asia Minor forming the southwestern quarter of Phrygia. The origin of its name and inhabitants, the Lycaones, is lost in obscurity. * * * Our first acquaintance with this region is in the relation of the expedition of the younger Cyprus. Its limits varied at different times. At first it extended eastward from Iconium 23 geographical miles, and was separated from Cilicia on the south by the range of Mount Taurus, comprehending a large portion of what in later times was termed Cataonia.

Count Goblet d'Alviella,⁴ quoting Perrot and Chipiez,⁵ states that the Hittites introduced the Swastika on a bas-relief of Ibriz, Lycaonia, where it forms a border of the robe of a king or priest offering a sacrifice to a god.

ARMENIA.

M. J. de Morgan (the present director of the Gizeh Museum at Cairo), under the direction of the French Government, made extensive excavations and studies into the prehistoric antiquities and archæology of Russian Armenia. His report is entitled "Le Premier Âge de Métaux dans l'Arménie Russe."⁶ He excavated a number of prehistoric cemeteries, and found therein various forms of crosses engraved on ceintures, vases, and medallions. The Swastika, though present, was more rare. He found it on the heads of two large bronze pins (figs. 35 and 36) and on one piece of pottery (fig. 37) from the prehistoric tombs. The bent arms are all turned to the left, and would be the Suavastika of Prof. Max Müller.

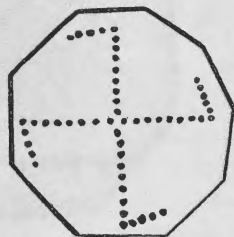


Fig. 35.

BRONZE PIN-HEAD FROM
CHEITHAN-THAGH.

De Morgan, "Au Caucase," fig. 177.

¹ "Det Saakaldte Hagebors," Copenhagen, 1877.

² "La Migration des Symboles," pp. 51, 52.

³ Bull. de la Soc. d'Anthrop., December 6, 1888, XI, p. 671.

⁴ "La Migration des Symboles," p. 51.

⁵ "Histoire de l'Art dans l'Antiquité," IV.

⁶ "Mission Scientifique au Caucase."

CAUCASUS.

In Caucasus, M. E. Chantre¹ found the Swastika in great purity of form. Fig. 38 represents portions of a bronze plaque from that country, used on a ceinture or belt. Another of slightly different style, but with square cross and arms bent



Fig. 36.

BRONZE PIN-HEAD FROM
AKTHALA.
De Morgan, "Au Caucase," fig.
178.

at right angles, is represented in his pl. 8, fig. 5. These belonged to the first age of iron, and much of the art was intricate.² It represented animals as well as all geometric forms, crosses, circles (concentric and otherwise), spirals, meanders, chevrons, herring bone, lozenges, etc. These were sometimes cast in the metal, at other times repoussé, and again were engraved, and occasionally these methods were employed together. Fig. 39 shows another form, frequently employed and suggested as a possible evolution of the Swastika, from the same locality and same plate. Fig. 40 represents



Fig. 37.

SWASTIKA MARK ON BLACK POTTERY.
Cheithan-thagh.
De Morgan, "Au Caucase," fig. 179.

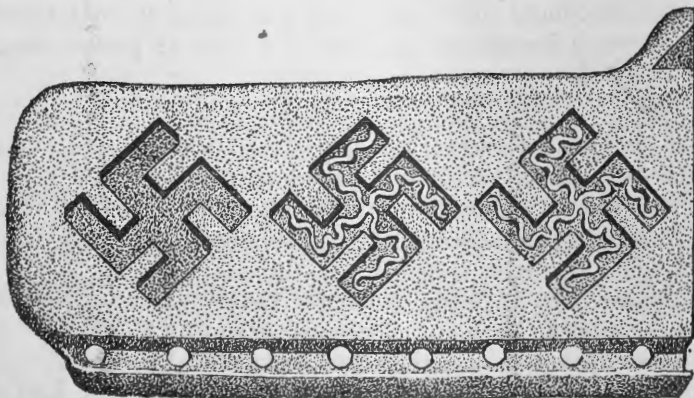


Fig. 38.

FRAGMENT OF BRONZE CEINTURE.
Swastika repoussé.
Necropolis of Koban, Caucasus.
Chantre, "Le Caucase," pl. 11, fig. 3.

signs reported by Waring³ as from Asia Minor, which he credits, without explanation, to Ellis's "Antiquities of Heraldry."

¹"Recherches Anthropologiques dans le Caucase," tome deuxième, période proto-historique, Atlas, pl. 11, fig. 3.

²Count Goblet d'Alviella, "La Migration des Symboles," p. 51.

³"Ceramic Art in Remote Ages," pl. 41, figs. 5 and 6.

The specimen shown in fig. 41 is reported by Waring,¹ quoting Rzewusky,² as one of the several branding marks used on Circassian horses for identification.

Mr. Frederick Remington, the celebrated artist and literateur, has an article, "Cracker Cowboy in Florida,"³ wherein he discourses of the forgery of brands on cattle in that country. One of his genuine brands is a circle with a small cross in the center. The forgery consists in elongating each arm of the cross and turning it with a scroll, forming an ogee Swastika (fig. 13*d*), which, curiously enough, is practically the same brand used on Circassian horses (fig. 41).



Fig. 39.

BRONZE AGRAFE OR BELT PLATE.

Triskelion in spiral.

Koban, Caucasus.

Chantre, "Le Caucase," pl. 11, fig. 4.

Max Ohnefalsch-Richter⁴ says that instruments of copper (*audumbaroasih*) are recommended in the Atharva-Veda to make the Swastika, which represents the figure 8; and thus he attempts to account for the use of that mark branded on the cows in India (supra, p. 772), on the horses in Circassia (fig. 41), and said to have been used in Arabia.



Fig. 40.

SWASTIKA SIGNS FROM ASIA MINOR.

Waring, "Ceramic Art in Remote Ages," pl. 41, figs. 5 and 6.



ASIA MINOR—TROY (HISSARLIK).



Fig. 41.

BRAND FOR HORSES IN CIRCASSIA.

Ogee Swastika, triskelion.

Waring, "Ceramic Art in Remote Ages," pl. 42, fig. 20c.

Many specimens of the Swastika were found by Dr. Schliemann in the ruins of Troy, principally on spindle whorls, vases, and bijoux of precious metal. Zmigrodzki⁵ made from Dr. Schliemann's great atlas the following classification of the objects found at Troy, ornamented with the Swastika and its related forms:

Fifty-five of pure form; 114 crosses with the four dots, points or alleged nail holes (*Croix swastical*); 102 with three branches or arms (triskelion); 86 with five branches or arms; 63 with six branches or arms; total, 420.

Zmigrodzki continues his classification by adding those which have

¹ "Ceramic Art in Remote Ages," pl. 42, fig. 20c.

² "Mines de l'Orient," v.

³ Harper's Magazine, August, 1895.

⁴ Bulletins de la Soc. d'Anthrop., 1888, II, p. 678.

⁵ Dixième Congrès International d'Anthropologie et d'Archéologie Préhistorique, Paris, 1889, p. 474.

relation to the Swastika thus: Eighty-two representing stars; 70 representing suns; 42 representing branches of trees or palms; 15 animals non-ferocious, deer, antelope, hare, swan, etc.; total, 209 objects. Many of these were spindle whorls.

Dr. Schliemann, in his works, "Troja" and "Ilios," describes at length his excavations of these cities and his discoveries of the Swastika on many objects. His reports are grouped under titles of the various cities, first, second, third, etc., up to the seventh city, counting always from the bottom, the first being deepest and oldest. The same system will be here pursued. The first and second cities were 45 to 52 feet (13 to 16 meters) deep; the third, 23 to 33 feet (7 to 10 meters) deep; the fourth city, 13 to 17.6 feet (4 to 5½ meters) deep; the fifth city, 7 to 13 feet (2 to 4 meters) deep; the sixth was the Lydian city of Troy, and the seventh city, the Greek Ilium, approached the surface.

First and Second Cities.—But few whorls were found in the first and second cities¹ and none of these bore the Swastika mark, while thousands were found in the third, fourth, and fifth cities, many of which bore the Swastika mark. Those of the first city, if unornamented, have a uniform lustrous black color and are the shape of a cone (fig. 55) or of two cones joined at the base (figs. 52 and 71). Both kinds were found at 33 feet and deeper. Others from the same city were ornamented by incised lines rubbed in with white chalk, in which case they were flat.² In the second city the whorls were smaller than in the first. They were all of a black color and their incised ornamentation was practically the same as those from the upper cities.³



Fig. 42.

FRAGMENT OF LUSTROUS
BLACK POTTERY.

Swastika, right.

Depth, 23 feet.

Schliemann, "Ilios," fig. 247.

Zmigrodzki congratulated himself on having discovered among Schliemann's finds what he believed to be the oldest representation of the Swastika of which we had reliable knowledge. It was a fragment of a vase (fig. 42) of the lustrous black pottery peculiar to the whorls of the first and second cities. But Zmigrodzki was compelled to recede, which he did regretfully, when Schliemann, in a later edition, inserted the footnote (p. 350) saying, that while he had found this (with a companion piece) at a great depth in his excavations, and had attributed them to the first city, yet, on subsequent examination, he had become convinced that they belonged to the third city.

The Swastika, turned both ways 卐 and 卍 , was frequent in the third, fourth, and fifth cities.

The following specimens bearing the Swastika mark are chosen, out of the many specimens in Schliemann's great album, in order to make a fair representation of the various kinds, both of whorls and of Swas-

¹ "Ilios," pp. 229, 350, note 1.

² Ibid, figs. 63-70, p. 229.

³ Ibid, p. 303.

tikas. They are arranged in the order of cities, the depth being indicated in feet.

The Third, or Burnt, City (23 to 33 feet deep).—The spindle-whorl shown in fig. 43 contains two Swastikas and two crosses.¹ Of the one

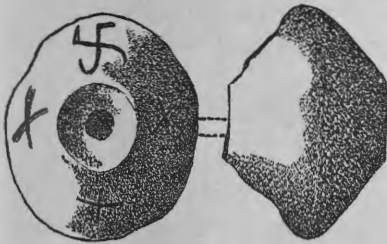


Fig. 43.

SPINDLE-WHORL WITH TWO SWASTIKAS AND TWO CROSSES.

Depth, 23 feet.

Schliemann, "Ilios," fig. 1868.

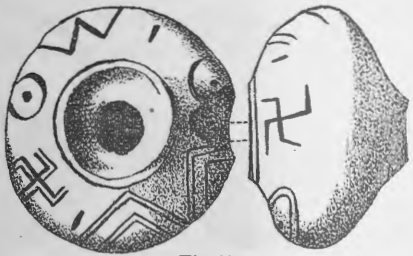


Fig. 44.

SPINDLE-WHORL WITH TWO SWASTIKAS.

Depth, 23 feet.

Schliemann, "Ilios," fig. 1874.

Swastika, two arms are bent to the right at right angles, while the other two are bent to the right in curves. The other Swastika has but two bends, one at right angles, the other curved, both to the right. The specimen shown in fig. 44 has two Swastikas, in one of which the four arms are bent at right angles to the left. The entire figure is traced in

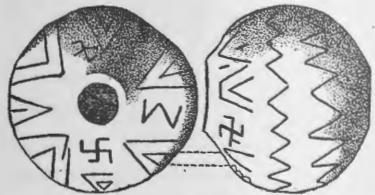


Fig. 45.

SPINDLE-WHORL WITH TWO SWASTIKAS.

Depth, 23 feet.

Schliemann, "Ilios," fig. 1919.



Fig. 46.

SPINDLE-WHORL WITH TWO SWASTIKAS.

Depth, 28 feet.

Schliemann, "Ilios," fig. 1826.

The ends of the four arms in both are bent at right angles, one to the right, the other to the left. Fig. 46 represents a spindle-whorl with two irregular Swastikas; but one arm is bent at right angles and all the arms and points are uncertain and of unequal lengths. The rest of the field is covered with indefinite and inexplicable marks, of which the only ones noteworthy are points or dots, seven in number. In fig. 47 the top is surrounded by a line of zigzag

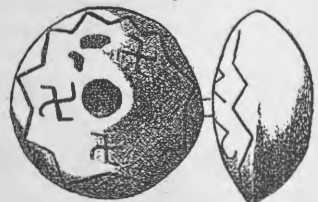


Fig. 47.

SPINDLE-WHORL WITH THREE SWASTIKAS.

Depth, 23 feet.

Schliemann, "Ilios," fig. 1851.

¹ All spindle-whorls from the hill of Hissarlik are represented one-half natural size.

or dog-tooth ornaments. Within this field, on the upper part and equidistant from the central hole, are three Swastikas, the ends of all of which turn to the left, and but one at right angles. All three have

one or more ends bent, not at any angle, but in a curve or hook, making an ogee. Fig. 48 shows a large whorl with two or three Swastikas on its upper surface in connection with several indefinite marks apparently without meaning. The dots are

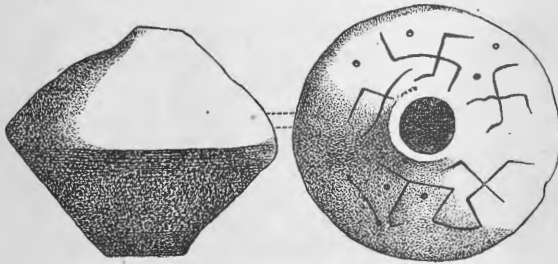


Fig. 48.

SPINDLE-WHORL WITH SWASTIKAS.

Depth, 23 feet.

Schliemann, "Ilios," fig. 1982.

interspersed over the field, the Swastikas all bent to the right, but with uncertain lines and at indefinite angles. In one of them the main line forming the cross is curved toward the central hole; in another, the ends are both bent in the same direction—that is, pointing to the periphery of the whorl. Fig. 49 shows a sphere or globe (see figs. 75, 88) divided by longitudinal lines into four segments, which are again divided by an equatorial line. These segments contain marks or dots, while one segment contains a normal Swastika turned to the left. This terra-cotta ball has figured in a peculiar degree in the symbolic representation of the Swastika. Greg says of it:¹

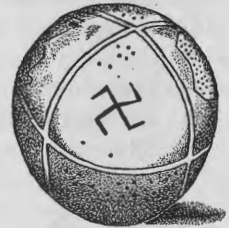


Fig. 49.

SPHERE DIVIDED INTO EIGHT SEGMENTS, ONE OF WHICH CONTAINS A SWASTIKA.

Schliemann, "Ilios," fig. 1999.

We see on one hemisphere the 卐 standing for Zeus (=Indra) the sky god, and on the other side a rude representation of a sacred (*somma*) tree; a very interesting and curious western perpetuation of the original idea and a strong indirect proof of the 卐 standing for the emblem of the sky god.

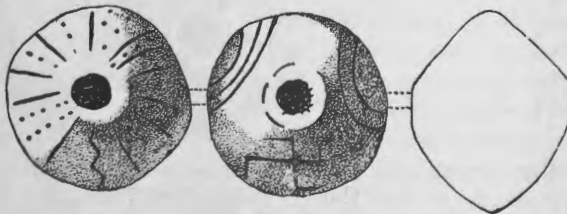


Fig. 50.

BICONICAL SPINDLE-WHORL WITH SWASTIKA.

Schliemann, "Ilios," fig. 1949.

Fig. 50 represents one of the biconical spindle-whorls with various decorations on the two sides, longitudinal lines interspersed with dots, arcs of concentric circles arranged in three

parallels, etc. On one of these sides is a normal Swastika, the arms crossing at right angles, the ends bent at right angles to the left.

¹ Archæologia, XLVIII, pt. 2, p. 322.

The specimen shown in fig. 51 contains four perfect Swastikas and two inchoate and uncertain. Both of the latter have been damaged by breaking the surface. The four Swastikas all have their arms bent to the right; some are greater than at right angles, and one arm is curved. Several ends are tapered to a point. Fig. 52 shows a whorl of biconical form. It contains two Swastikas, the main arms of which are ogee

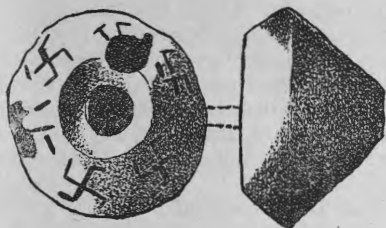


Fig. 51.

BICONICAL SPINDLE-WHORL WITH SIX SWASTIKAS.

Depth, 33 feet.

Schliemann, "Ilios," fig. 1859.

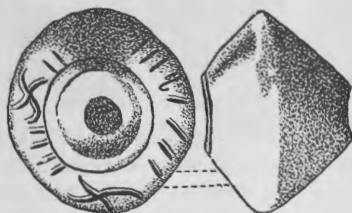


Fig. 52.

BICONICAL SPINDLE-WHORL WITH TWO OEGEE SWASTIKAS.

Depth, 33 feet.

Schliemann, "Ilios," fig. 1876.

forms, crossing each other at the center at nearly right angles, the ogee ends curving to the right. In fig. 53 the entire field of the upper surface is filled with, or occupied by, a Greek cross, in the center of which is the central hole of the whorl, while on each of the four arms is represented a Swastika, the main arms all crossing at right angles, the ends all bent to the right at a slightly obtuse angle. Each of these bent ends tapers to a point, some with slight curves and a small flourish. (See figs. 33 and 34 for reference to this flourish.) The specimen shown in fig. 54 has a center field in its upper part, of which the decoration consists of incised parallel lines forming segments of circles, repeated in each one of the four quarters of the field. The center hole is surrounded by two concentric rings of incised lines. In one of these spaces is a single Swastika; its main arms crossing at right angles, two of its ends bent to the left at right angles, the other two in the same direction and curved.



Fig. 53.

SPINDLE-WHORL WITH FOUR SWASTIKAS.

Depth, 33 feet.

De Mortillet, "Musée Préhistorique," fig. 1240.



Fig. 54.

SPINDLE-WHORL WITH ONE SWASTIKA.

Depth, 33 feet.

De Mortillet, "Musée Préhistorique," fig. 1241.

The Fourth City (13.2 to 17.6 feet deep).—Schliemann says:¹

We find among the successors of the burnt city the same triangular idols; the same primitive bronze battle-axes; the same terra-cotta vases, with or without tripod feet; the same double-handled goblets (*δέπα ἀμφικύπελλα*); the same battle-axes of jade, porphyry, and diorite; the same rude stone hammers, and saddle querns of trachyte. * * * The number of rude stone hammers and polished stone axes are fully thrice as large as in the third city, while the masses of shells and cockles

¹ "Ilios," pp. 518, 571.

accumulated in the débris of the houses are so stupendous that they baffle all description. The pottery is coarser and of a ruder fabric than in the third city.

* * * There were also found in the fourth city many needles of bone for female handiwork, bear tusks, spit rests of mica schist, whetstones of slate, porphyry, etc., of the usual form, hundreds of small silex saws, and some knives of obsidian. Stone whorls, which are so abundant at Mycenæ, are but rarely found here; all of those which occur are, according to Mr. Davis, of steatite. On the other hand, terra-cotta whorls, with or without incised ornamentation, are found by thousands; their forms hardly vary from those in the third (the burnt) city, and the same may be generally said of their incised ornamentation. * * * The same representation of specimens of whorls are given as in the third city, and the same observations apply.

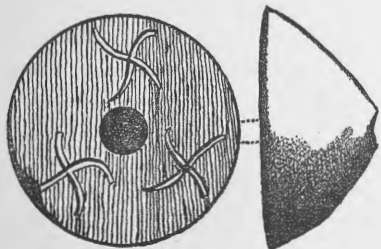


Fig. 55.

CONICAL SPINDLE-WHORL WITH THREE OEGEE SWASTIKAS.

Depth, $13\frac{1}{2}$ feet.

Schliemann, "Ilios," fig. 1850.

Fig. 55 shows a simple cone, the upper surface being flat and without other decoration than three Swastikas equidistant from the hole and from each other, all made by the two crossed ogee lines with ends curved to the right. This specimen is much like that of fig. 71 (Madam Schliemann collection in the U. S. National Museum, Cat. No. 149704). Fig. 56 shows a remarkable spindle-whorl. Its marks greatly excited the interest of Dr. Schliemann, and he devoted much space to the discussion of these and similar characters. The whorl is in the form of a cone. It bears upon its conical surface four Swastikas, the ends of three of which bend to the right and one to the left. There are but two of these ends which bend at right angles. Most of them are at an obtuse angle, while the ends of two are curved. Some taper to a point and finish with a slight flourish. The other marks which so interested Dr. Schliemann were the chevron ornament (zigzag), drawn in parallel lines, which, he strongly argued, and fortified with many authorities, represented lightning. The second series of marks he called a "burning altar." This assertion he also fortified with authorities and with

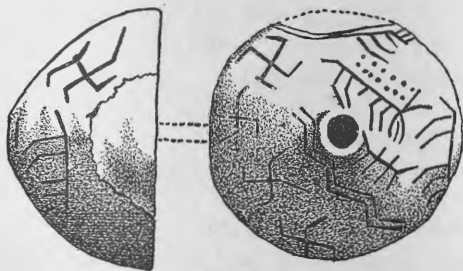


Fig. 56.

CONICAL SPINDLE-WHORL WITH FOUR SWASTIKAS OF VARIOUS KINDS.

Depth, $13\frac{1}{2}$ feet.

Schliemann, "Ilios," fig. 1878.

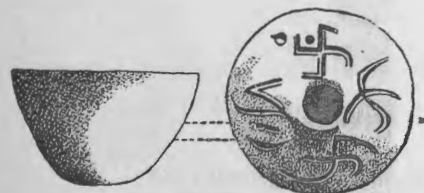


Fig. 57.

CONICAL SPINDLE-WHORL WITH SWASTIKAS.

Depth, $13\frac{1}{2}$ feet.

Schliemann, "Ilios," fig. 1894.

represented lightning. The second series of marks he called a "burning altar." This assertion he also fortified with authorities and with

illustrations of a similar sign from different countries. (See fig. 101.) The third series of marks represented an animal, name and character

unknown, with a head or tusks with two large branching horns or ears, a straight back, a stiff but drooping tail, four legs, and two rows of the remarkable dots—seven in one, six in the other—placed over the back of the animal. (See figs. 99 and 100.) Fig. 57 represents another cone-shaped whorl, the flat surface of which is engraved with one perfect Swastika, the two arms crossing each

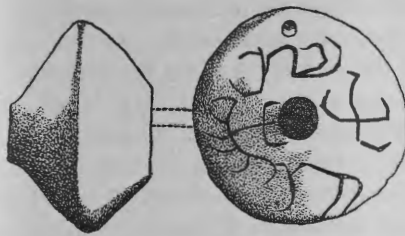


Fig. 58.

BICONICAL SPINDLE-WHORL WITH ONE SWASTIKA.

Depth, 13½ feet.

Schliemann, "Ilios," fig. 1983.

other at right angles and the two ends bending at right angles to the right; the other two are curved, also to the right. Two of the other figures Dr.

Schliemann calls Swastikas, although they are uncertain in some of their arms and angles. The fourth character he imagined to be an inchoate or attempted Swastika. Fig. 58

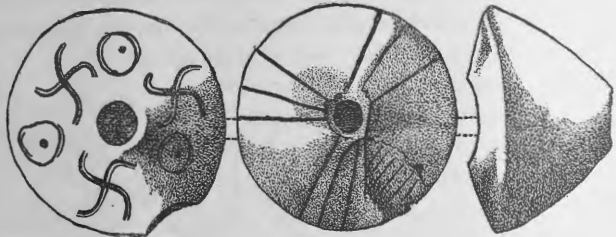


Fig. 59.

BICONICAL SPINDLE-WHORL WITH THREE OGEE SWASTIKAS.

Depth, 13½ feet.

Schliemann, "Ilios," fig. 1990.

shows a biconical whorl with curious and inexplicable characters. One of them forms a crude Swastika, which, while the main arms cross at right angles the ends are bent at uncertain angles, three to the left and one to the right. These characters are so undetermined that it is doubtful if they could have had any significance, either ornamental or otherwise. Fig. 59 is almost conical, the flat surface thereof being only slightly raised at the center. It is much the same form as the whorls shown in figs. 55 and 71. The nearly flat surface is the top, and on it, equidistant from the center

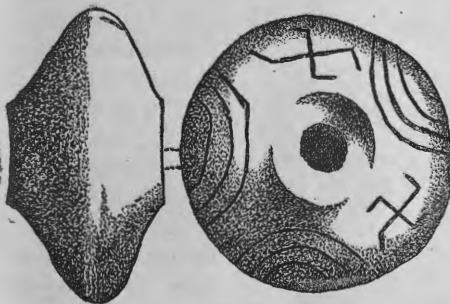


Fig. 60.

BICONICAL SPINDLE-WHORL WITH TWO SWASTIKAS.

Depth, 16½ feet.

Schliemann, "Ilios," fig. 1863.

hole and from each other, are three ogee Swastikas of double lines, with their ends all curved to the right. In the alternate spaces are small incised circles, with dots in the centers. In fig. 60 a biconical

whorl is shown. It has three of the circle segments marked in equilateral positions, with three or four parallel lines, after the style shown in fig. 54. In the spaces are two Swastikas, in both of which the two main arms cross at right angles. Some of the ends bend at a right, and others at an obtuse, angle. In one of the Swastikas the bent ends turn toward each other, forming a rude figure 8.

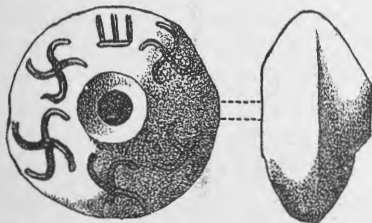


Fig. 61.

BICONICAL SPINDLE-WHORL WITH FIVE OEGE SWASTIKAS.

Depth, 18 feet.

Schliemann, "Ilios," fig. 1905.

The specimen shown in fig. 61 is biconical, but much flattened; it contains five ogee Swastikas, of which the ends of four bend to the right and one to the left. In an interval between them is one of the burning altars. Fig. 62 shows three Swastikas with double

parallel lines. The main arms cross each other at right angles; the ends are bent at nearly right angles, one to the left, one to the right, and the other both ways. Fig. 63 represents

a spindle-whorl with a cup-shaped depression around the central hole, which is surrounded by three lines in concentric circles, while on the field, at 90 degrees from

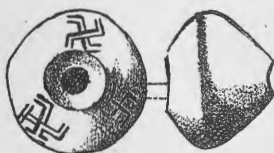


Fig. 62.

SPINDLE-WHORL WITH THREE SWASTIKAS.

Depth, 19.8 feet.

Schliemann, "Ilios," fig. 1855.

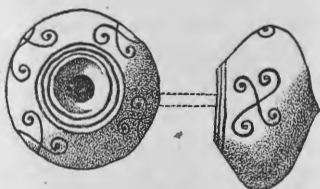


Fig. 63.

SPINDLE-WHORL HAVING FOUR OEGE SWASTIKAS WITH SPIRAL VOLUTES.

Depth, 18 feet.

Schliemann, "Ilios," fig. 1868.

each other, are four ogee Swastikas (tetraskelions), the arms all turning to the left and spirally each upon itself. The specimen shown in

fig. 64 is biconical, though, as usual, the upper cone is the smallest. There are parallel lines, three in a set, forming the segments of three circles, in one space of which appears a Swastika of a curious and unique form, similar to that shown in fig.

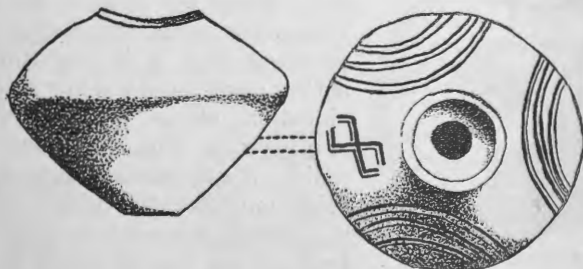


Fig. 64.

BICONICAL SPINDLE-WHORL WITH ONE SWASTIKA.

Depth, 19.8 feet.

Schliemann, "Ilios," fig. 1865.

60. The two main arms cross each other at very nearly right angles and the ends also bend at right angles toward and approaching each other, so

that if continued slightly farther they would close and form a decorative figure 8. The specimen shown in fig. 65 is decorated with parallel lines, three in number, arranged in segments of three circles, the periphery of which is toward the center, as in figs. 60 and 64. In one of the spaces is a Swastika of curious form; the main arms cross each other at right angles, but the four ends represent different styles—two are bent square to the left, one square to the right, and the fourth curves to the left at no angle. Fig. 66 shows a biconical whorl, and its top is decorated to represent three Swastikas and three burning altars.

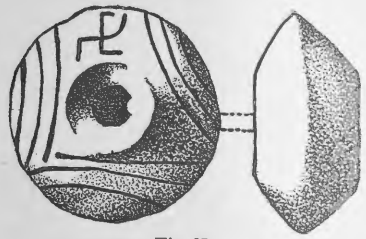


Fig. 65.

BICONICAL SPINDLE-WHORL WITH ONE SWASTIKA.

Depth, 19.8 feet.

Schliemann, "Ilios," fig. 1866.

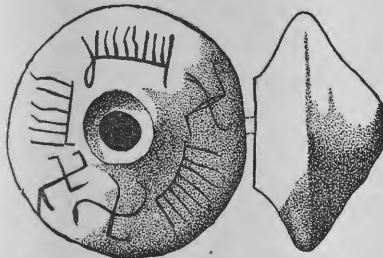


Fig. 66.

BICONICAL SPINDLE-WHORL WITH THREE SWASTIKAS AND THREE BURNING ALTARS.

Depth, 19.8 feet.

Schliemann, "Ilios," fig. 1872.

a chevron decoration. Fig. 68 shows three Swastikas, the ends of the arms of which are all bent to the left. One Swastika is composed of

two of them show corrections, the marks at the ends having been changed in one case at a different angle and in another from a straight line to a curve. Fig. 67 shows four specimens of Swastika, the main arms of all of which cross at right angles. The ends all bend to the right, at nearly right angles, tapering to a point and finishing with the slight flourish noted in the Jain Swastika (fig. 34c). They are alternated with

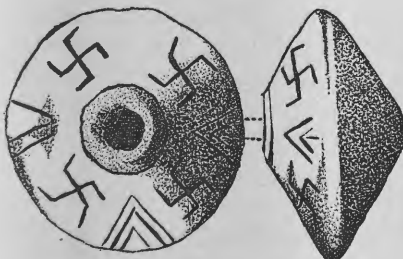


Fig. 67.

BICONICAL SPINDLE-WHORL WITH FOUR SWASTIKAS.

Depth, 19.8 feet.

Schliemann, "Ilios," fig. 1873.

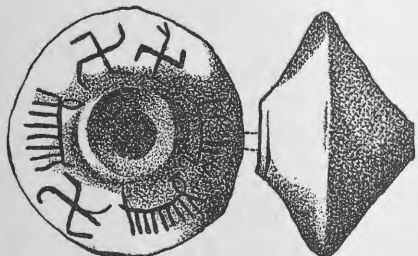


Fig. 68.

BICONICAL SPINDLE-WHORL WITH THREE SWASTIKAS OF DIFFERENT STYLES.

Depth, 19.8 feet.

Schliemann, "Ilios," fig. 1911.

two ogee lines. Two arms of another are curved, but all others are bent at right angles, some of them tapering to points, finishing with a H. Mis. 90, pt. 2—52

little flourish (figs. 67 and 34c). One of these ends, like that in fig. 66, has been corrected by the maker. Fig. 69 represents one Swastika in which the main arms cross at nearly right angles. Both ends of one

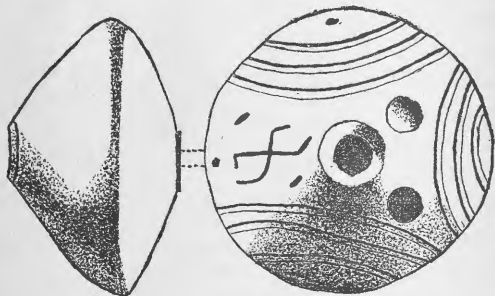


Fig. 69.

BICONICAL SPINDLE-WHORL WITH ONE SWASTIKA OF THE FIGURE-8 STYLE.

Depth, 19.8 feet.

Schliemann, "Ilios," fig. 1861.

The U. S. National Museum was, during 1893, the fortunate recipient of a collection of objects from Madame Schliemann, which her husband,

before his death, had signified should be given to the United States as a token of his remembrance of and regard for his adopted country. He never forgot that he was an American citizen, and, preparing for death, made his acknowledgments in the manner mentioned. The collection consisted of 178 objects, all from ancient Troy, and they made a fair representation of his general finds. This collection is in the Department of Prehistoric Anthropology.

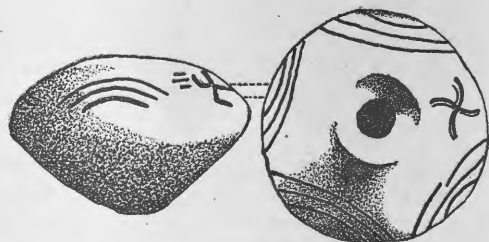


Fig. 70.

BICONICAL SPINDLE-WHORL WITH ONE SWASTIKA, SLIGHTLY OEGEE.

Depth, 19.8 feet.

Schliemann, "Ilios," fig. 1864.

In this collection is a spindle-whorl, found at 13½ feet (4 meters) depth and belonging to the fourth city. It had three Swastikas upon its face, and is here shown as fig. 71.¹

The Fifth City.—Schliemann says:²

The rude stone hammers found in enormous quantities in the fourth city are no longer found in this stratum, nor did the stone axes, which are so very abundant there, occur again here. In-

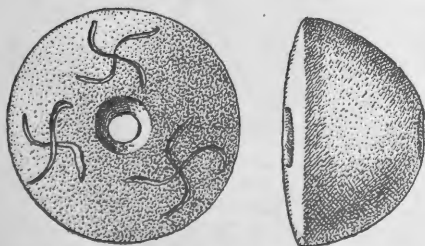


Fig. 71.

CONICAL SPINDLE-WHORL WITH THREE OEGEE SWASTIKAS.

Depth, 13.5 feet.

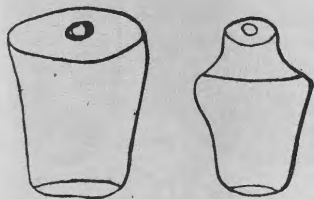
Gift of Madame Schliemann. Cat. No. 149704, U. S. N. M.

¹ "Ilios," fig. 1852.

² *Ibid*, p. 573.

stead of the hundreds of axes I gathered in the fourth city, I collected in all only two here. * * * The forms of the terra-cotta whorls, too, are in innumerable instances different here. These objects are of a much inferior fabric, and become elongated and pointed. Forms of whorls like Nos. 1801, 1802, and 1803 [see figs. 72, 73, and 74], which were never found before, are here plentiful.

The Sixth and Seventh Cities.—The sixth city is described in “Ilios,” page 587, and the seventh on pages 608 and 618. Both cities contained occasional whorls of clay, all thoroughly baked, without incised or painted ornamentation, and shed no further light on the Swastika.



Figs. 72, 73, 74.

FORMS OF WHORLS FROM THE FIFTH BURIED CITY OF
HISSARLIK, FOR COMPARISON.

Schliemann, “Ilios,” figs. 1801, 1802, 1803.

Fig. 75 represents the opposite hemispheres of a terra-cotta ball, found at a depth of 26 feet, divided by incised lines into fifteen zones, of which two are ornamented with points and the middle zone, the largest of all, with thirteen specimens of 卐 and 卐 .

Zmigrodzki says¹ that there were found by Schliemann, at Hissarlik, fifty-five specimens of the Swastika “pure and simple” (pp. 809, 826). It will be perceived by examination that the Swastika “pure and simple” comprised Swastikas of several forms; those in which the four arms of the cross were at other angles besides right angles, those in which the ends bent at square and other angles to the right; then those to the left (Burnouf and Max Müller’s Suavastika); those in which the bends were, some to the right and some to the left, in the same design; where the points tapered off and turned outward with a flourish; where the arms bent at no angle, but were in spirals each upon itself, and turned, some to the right, some to the left. We shall see other related forms, as where the arms turn spirally upon each other instead of upon themselves. These will sometimes have three, five, six, or more arms, instead of four (p. 768). The cross and the circle will also appear in connection with the Swastika; and other designs, as zigzags (lightning), burning altars, men, animals, and similar representations will be found associated with the Swastika, and are only related to it by the association of similar objects from the same locality. A description of their patterns will include those already figured, together with Schliemann’s

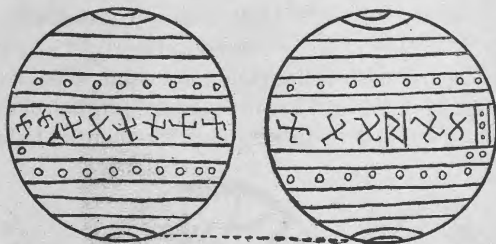


Fig. 75.

TERRA-COTTA SPHERE WITH THIRTEEN SWASTIKAS,

Third city. Depth, 26 feet.

Schliemann, “Ilios,” figs. 245, 246.

¹ Tenth Congr. Inter. d’Anthrop. et d’Archæol. Prehist., Paris, 1889, p. 474.

comments as to signification and frequency. They become more important because these related forms will be found in distant countries and among distant peoples, notably among the prehistoric peoples of America. Possibly these designs have a signification, possibly not. Dr. Schliemann thought that in many cases they had. Professor Sayce supported him, strongly inclining toward an alphabetic or linguistic, perhaps ideographic, signification. No opinion is advanced by the author on these theories, but the designs are given in considerable numbers, to the end that the evidence may be fully reported, and future investigators, radical and conservative, imaginative and unimaginative, theorists and agnostics, may have a fair knowledge of this mysterious sign, and

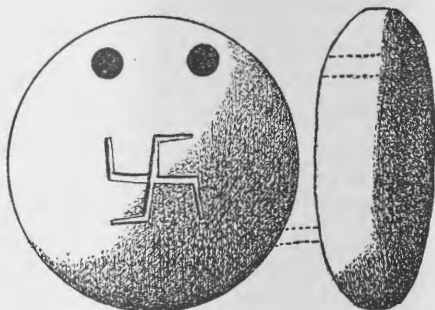


Fig. 76.

TERRA-COTTA DISK WITH ONE SWASTIKA.
Schliemann, "Ilios," fig. 1849.

an opportunity to indulge their respective talents at length. Possibly these associated designs may throw some light upon the origin or history of the Swastika or of some of its related forms.



Fig. 77.

SPINDLE-WHORL WITH OEGE SWASTIKA.

Third city. Depth, 23 feet.
Schliemann, "Ilios," fig. 1892.

The specimen represented in fig. 76 is not a spindle-whorl, as shown by the number and location of the holes. It bears a good representation of a Swastika the form of which has been noticed several times. The two main arms cross each other at nearly right angles. The ends of the arms all bend to the right at a slightly obtuse angle and turn outward with a flourish somewhat after the style of the Jain Swastika (fig. 34c). Fig. 77 represents a spindle-whorl with a Swastika of the ogee style curved to the right. The center hole of the whorl forms the

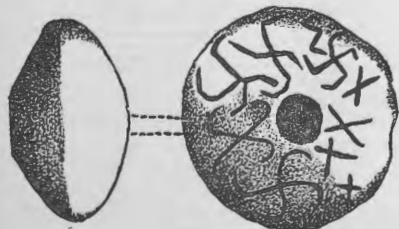


Fig. 78.

BICONICAL SPINDLE-WHORL WITH IRREGULAR SWASTIKAS AND CROSSES.

Fourth city. Depth, 13.6 feet.
Schliemann, "Ilios," fig. 1871.

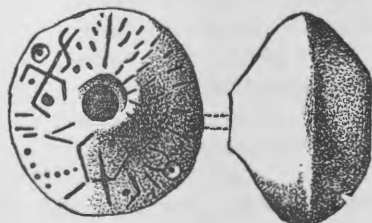


Fig. 79.

BICONICAL SPINDLE-WHORL WITH UNCERTAIN AND MALFORMED SWASTIKAS.

Third city. Depth, 33 feet.
Schliemann, "Ilios," fig. 1870.

ter of the sign. The figure is of double lines, and in the interspaces are four dots, similar to those in figs. 96-98, and others which Dr. Schliemann

reports as common, and to which he attributes some special but unknown meaning. Swastikas and crosses of irregular shape and style are shown in the field of fig. 78. Two fairly well formed Swastikas appear, both of the ogee style, with the ends curved to the right. One is of the style resembling the figure 8 (see figs. 60 and 64). Two others are crudely and irregularly formed, and would scarcely be recognized as Swastikas except for their association. Fig. 79 represents uncertain and malformed Swastikas. The arms are bent in different directions in the same line. Two of the main arms are not bent. The inexplicable dots are present, and the field is more or less covered with unmeaning or, at least, unexplained marks. Fig. 80 also illustrates the indefinite and inchoate style of decoration. One unfinished Swastika appears which, unlike anything we have yet seen, has a circle with a dot in the center for the body of the Swastika at the crossing of the main arms. Fig. 81 shows two Swastikas, both crossing their main arms at right angles and the ends bending also at right angles—one to the right, the other to the

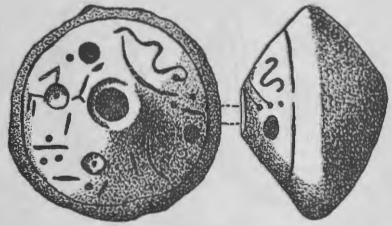


Fig. 80.

BICONICAL SPINDLE-WHORL WITH IRREGULAR AND PARTLY FORMED SWASTIKAS HAVING LARGE DOT IN CENTER.

Fourth city. Depth, 23 feet.

Schleemann, "Ilios," fig. 1375.

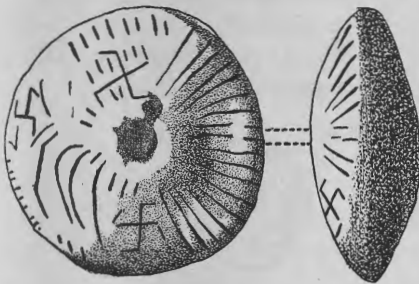


Fig. 81.

BICONICAL SPINDLE-WHORL, FLATTENED, WITH TWO SWASTIKAS AND INDEFINITE DECORATION.

Schleemann, "Ilios," fig. 1947.

left. This specimen is inserted here because of the numerous decorations of apparently unmeaning, or, at least, unexplained, lines. Fig. 82 shows four segmented circles with an indefinite Swastika in one of the spaces. The ends are not well turned, only one being well attached to the main arms. One of the ends is not joined, one overruns and forms a sort of cross; the other has no bend. Fig. 83 contains an unmistakable Swastika, the main arms of which cross at right angles, turning to the left with an ogee curve. The peculiarity of this specimen is that the center of the sign is inclosed in a circle, thus showing the indifference

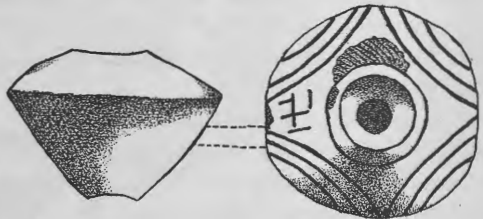


Fig. 82.

BICONICAL SPINDLE-WHORL WITH ONE SWASTIKA AND FOUR SEGMENTS OF CIRCLES.

Third city. Depth, 33 feet.

Schleemann, "Ilios," fig. 1989.

of the Swastika sign to other signs, whether cross or circle. The outer parts of the field are occupied with the parallel lines of the circle segment, as shown in many other specimens. The specimen shown in fig. 84 is similar in style to the last. The bodies of six Swastikas are formed by a circle and dot, while the arms of the cross start from the outside of the circle, extending themselves in curves, all of them to the right. (See fig. 13*d*.) It has no other ornamentation. The same remark is

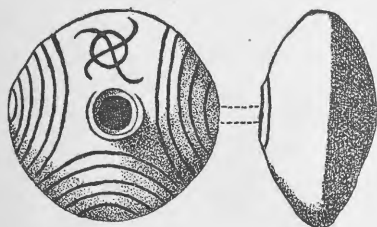


Fig. 83.

BICONICAL SPINDLE-WHORL, FLATTENED.

Ogee Swastika with central circle.

Third city. Depth, 23 feet.

Schliemann, "Illos," fig. 1987.

to be made about the indifferent use of the Swastika in association with

cross or circle. We have seen many Swastikas composed of the crossed ogee lines or curves. Figs. 85 and 86 show the same ogee lines and curves not crossed; and thus, while it may be that neither of them are Swastikas, yet they show a relationship of form from which the derivation of a Swastika would be easy.

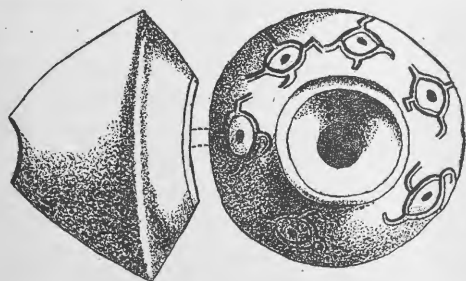


Fig. 84.

BICONICAL SPINDLE-WHORL WITH SIX OOGEE SWASTIKAS

HAVING CENTRAL CIRCLE AND DOT.

Third city. Depth, 23 feet.

Schliemann, "Illos," fig. 1862.

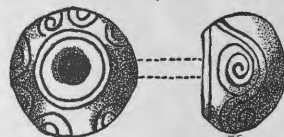


Fig. 85.

SPHERICAL SPINDLE-WHORL WITH
FLATTENED TOP AND OOGEE LINES
WHICH DO NOT FORM SWASTIKAS.

Schliemann, "Illos," fig. 1890.

Attention has been called to decorations comprising segments of the circles incised in these whorls, the periphery of which is toward their centers (figs. 60, 64, 65, 69, 70, 82 and 83). Also to the mysterious dots (figs. 46, 56, 75, 76, 77, 79, 84, 92, 96 and 97). Fig. 87 shows a combination of the segments of three circles, the dots within each, and two Swastikas. Of the Swastikas, one is normal, turning to the right; the other turns to the right, but at an obtuse angle, with one end straight and the other irregularly curved. Fig. 88 represents two sections of a terra-

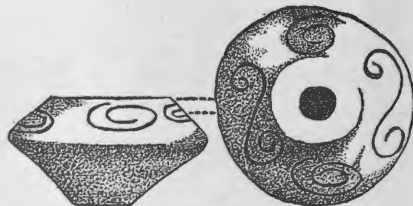


Fig. 86.

BICONICAL SPINDLE-WHORL WITH OOGEE CURVES WHICH
ARE NOT CROSSED TO FORM SWASTIKAS.

Schliemann, "Illos," fig. 1889.

cotta sphere divided similar to fig. 49. Each of these sections contains

a figure like unto a Swastika and which may be related to it. It is a circle with arms springing from the periphery, which arms turn all to the left, as they do in the ogee Swastika. One has seven, the other nine, arms. One has regular, the other irregular, lines and intervals. Fig. 89 represents a spindle-whorl of terra cotta nearly spherical, with decoration of a large central dot and lines springing thereout, almost like the spokes of a wheel, then all turning to the left as volutes. In some countries this has been called the sun symbol, but there is nothing to indicate that it had any signification at Hissarlik.

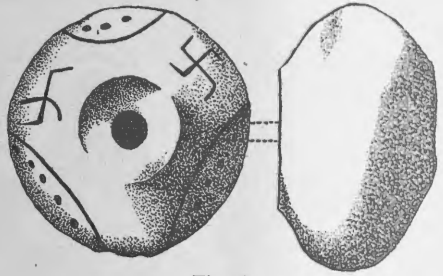


Fig. 87.

SPHERICAL SPINDLE-WHORL, FLATTENED.

Two Swastikas combined with segments and dots.

Schliemann, "Ilios," fig. 1988.

One of the marks resembles the long-backed, four-legged animal (figs. 99 and 100).¹ Figs. 90, 91, 92, and 93 show a further adaptation of the ogee curve developed into a Swastika, in which many arms start from the center circle around the central hole in the whorl, finally taking a spiral form. The relation of this to a sun symbol is only mentioned and not specified or declared. The inexplicable and constantly recurring dots are seen in fig. 90.



Fig. 88.

SECTIONS OF TERRA-COTTA SPHERE.²

Central circles with extended arms turning to the left, ogee and zigzag.

Schliemann, "Ilios," fig. 1993.

It is not contended that these are necessarily evolutions of the Swastika. We will see farther on many lines and forms of decoration by incised lines on these Trojan whorls, which may have had no relation to the Swastika, but are inserted here because persons rich in theories and brilliant in imagination have declared that they could see a resemblance, a relation, in this or some other decoration. As objects belonging to the same culture, from the same locality, and intimately associated with unmistakable Swastikas, they were part of the *res gestæ*, and as such entitled to admission as evidence in the case. The effect of their evidence is a legitimate subject for discussion and argument. To refuse these figures admission would

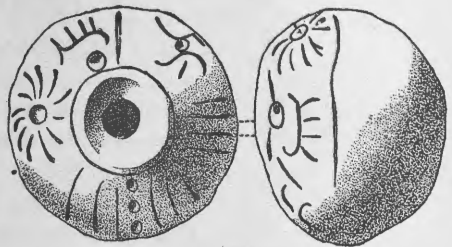


Fig. 89.

SPHERICAL SPINDLE-WHORL.

Large central dot with twelve arms, similar in form to the ogee Swastika.

Schliemann, "Ilios," fig. 1946.

¹ "Ilios" p. 418.

² See p. 786

be to decide the case against this contention without giving the opposing party an opportunity to see the evidence or to be heard in argument. Therefore the objects are inserted.

Specimens of other crosses are presented because the

Swastika is considered to be a form of the cross. There may have been no evolution or relationship between them; but no person is competent to decide from a mere inspection or by reason of dissimilarity that there was not. We have to plead *ignoramus* as to the growth and evolution of both cross and Swastika, because the origin of both



Fig. 90.

SPINDLE-WHORL.

Central dot with ogee arms radiating therefrom in different directions, but in the form of a Swastika. Third city. Depth, 29 feet. Schliemann, "Ilios," fig. 1830.



Fig. 91.

SPINDLE-WHORL WITH CENTRAL HOLE AND RADIATING ARMS.

Third city. Depth, 23 feet. Schliemann, "Ilios," fig. 1842.

is lost in antiquity. But all are fair subjects for discussion. There certainly is nothing improbable in the relationship and evolution between the Swastika and the cross. It may be almost assumed.

Evidence leading to conviction may be found in associated contemporaneous specimens. M. Montelius, an archæologist of repute in the National Museum at Stockholm, discovered eight stages of culture in the bronze age of that country, which discovery was based solely upon the foregoing principle applied to the fibulæ found in prehistoric graves. In assorting his stock of

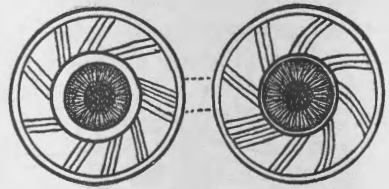


Fig. 92.

SPINDLE-WHORL WITH CENTRAL CIRCLE AND MANY ARMS.

Fourth city. Depth, 19.8 feet. Schliemann, "Ilios," fig. 1837.

fibulæ, he was enabled to lay out a series of eight styles, each different, but with many presentations. He arranged them seriatim, according to certain differences in size, style, elegance of workmanship, etc.,

No. 1 being the smallest, and No. 8 the largest and most elaborate. They were then classified according to locality and association, and he discovered that Nos. 1 and 2 belonged together, on the same body or in the same grave, and the same with Nos. 2 and 3, 3 and 4, and so on to No. 8, but that there was no general or indefinite intermixture; Nos. 1 and 3 or 2 and 4 were not found together and were not associated, and so on. Nos. 7 and 8 were associated, but not 6 and 8, nor 5 and 7, nor was there any association beyond adjoining numbers in the series. Thus Montelius was able to determine that each one or each two of the series formed a stage in the culture of these peoples. While the numbers of the series separated



Fig. 93.

SPINDLE-WHORL WITH CENTRAL HOLE, LARGE CIRCLE, AND MANY CURVED ARMS.

Third city. Depth, 29 feet. Schliemann, "Ilios," fig. 1833.

from each other, as 1, 5, 8, were never found associated, yet it was conclusively shown that they were related, were the same object, all served a similar purpose, and together formed an evolutionary series showing their common origin, derivative growth and continuous improvement in art, always by communication between their makers or owners.

Thus it may be with the other forms of crosses, and thus it appears to be with the circle and spiral Swastikas and those with ends bent in opposite and different directions. Just what their

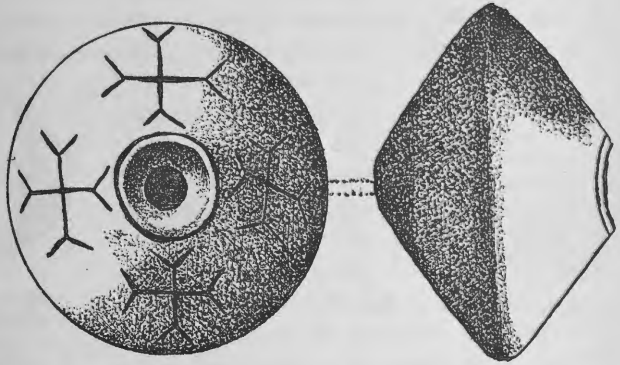


Fig. 94.

LARGE BICONICAL SPINDLE-WHORL.

Four crosses with bifurcated arms.

Third city. Depth, 23 feet.

Schliemann, "Ilios," fig. 1856.

relations are and at which end of the series the evolution began, is not argued. This is left for the theorists and imaginists, protesting, however, that they must not run wild nor push their theories beyond bounds. Fig. 94 represents four crosses, the main arms of which are at right angles, and each and all ends, instead of being turned at an angle which would make them Swastikas, are bifurcated and turn both

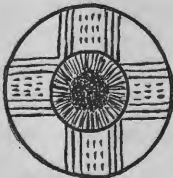


Fig. 95.

SPINDLE-WHORL.

Hole and large circle in center with broad arms of Greek cross.

Third city. Depth, 26.4 feet.

Schliemann, "Ilios," fig. 1820.

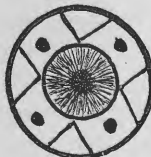


Fig. 96.

SPINDLE-WHORL.

Hole and large circle in center. Eextended parallel arms with dots, forming a Greek cross.

Third city. Depth, 23 feet.

Schliemann, "Ilios," fig. 1817.

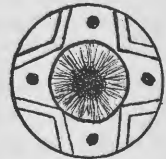


Fig. 97.

SPINDLE-WHORL.

Greek cross. Tapering arms with dots.

Third city. Depth, 23 feet.

Schliemann, "Ilios," fig. 1818.

ways, thus forming a foliated cross similar to the Maya cross, the "Tree of life." Figs. 95, 96, and 97 show Greek crosses. The centers of the crosses are occupied by the central hole of the whorl, while the arms extend to the periphery. In the centers of the respective arms are the ubiquitous dots. The question might here be asked whether these holes, which represented circles, stood for the sun symbol or solar disk. The

question carries its own answer and is a refutation of those who fancy they can see mythology in everything. Fig. 98 is the same style of figure with the same dots, save that it has three instead of four arms.



Fig. 98.

SPINDLE-WHORL.

Central hole and three arms with dots.

Third city. Depth, 23 feet.

Schliemann, "Ilios," fig. 1819.

Figs. 99 and 100 each show four of the curious animals heretofore represented (fig. 56) in connection with the Swastika. They are here inserted for comparison. They are all of the same form, and one description will serve. Back straight, tail drooping, four legs, round head showing eye on one side, and long ears resembling those of a rabbit

or hare, which, in fig. 56, are called horns. The general remarks in respect to the propriety of inserting crosses and burning altars (p. 824) apply with equal pertinency to these animals and to the unexplained dots seen on so many specimens.

Fig. 101 shows both ends of a spindle-whorl, and is here inserted because it represents one of the "burning altars" of Dr. Schliemann, associated with a Swastika, as in figs. 61, 66, and 68, and even those of figure-8 style (figs. 64 and 69).

Dr. Schliemann found, during his excavations on the hill of Hissarlik, no less than 1,800 spindle-whorls. A few were from the first and second cities; they were of somewhat peculiar form (figs. 72 and 74), but the greatest number were from the third city, thence upward in decreasing numbers.

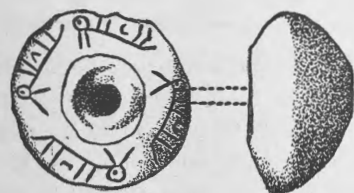


Fig. 100.

BICONICAL SPINDLE-WHORL.

Four animals are shown similar to those found associated with the Swastika.

Fourth city. Depth, 19.6 feet.

Schliemann, "Ilios," fig. 1867.

The Swastika pure and simple was found on 55 specimens, while its related or suggested forms were on 420 (pp. 809, 819). Many of the other whorls were decorated with almost every imaginable form of dot, dash, circle, star, lozenge, zigzag, with many indefinite and undecipherable forms. In presenting the claims of the Swastika as an intentional sign, with intentional, though perhaps

different, meanings, it might be unsatisfactory to the student to omit descriptions of these associated decorative forms. This description is impossible in words; therefore the author has deemed it wiser to insert



Fig. 99.

BICONICAL SPINDLE-WHORL.

Four animals are shown similar to those found associated with the Swastika.

Third city. Depth, 33 feet.

Schliemann, "Ilios," fig. 1877.

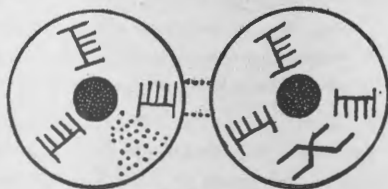


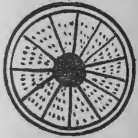
Fig. 101.

SPINDLE-WHORL WITH FIGURE-8 SWASTIKA (?) AND SIX "BURNING ALTARS."

Fourth city. Depth, 19.6 feet.

Schliemann, "Ilios," fig. 1838.

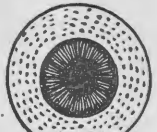
figures of these decorations as they appeared on the spindle-whorls found at Troy, and associated with those heretofore given with the Swastika. It is not decided, however, that these have any relation to the Swastika, or that they had any connection with its manufacture or existence, either by evolution or otherwise, but they are here inserted to the end that the student and reader may take due account of the association and make such comparison as will satisfy him. (Figs. 102 to 124.)



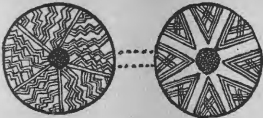
102.



103.



104.



105.



106.



107.



108.



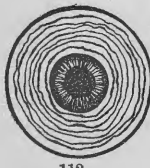
109.



110.



111.



112.



113.

Figs. 102-113.

TROJAN SPINDLE-WHORLS.

Schliemann, "Ilios."



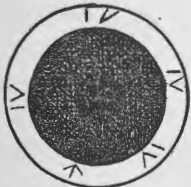
114.



115.



116.



117.



118.



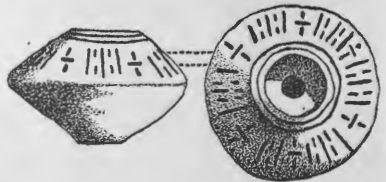
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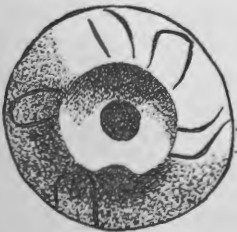
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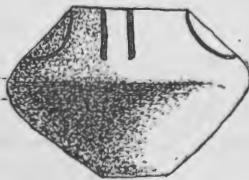
121.



122.



123.



124.

Figs. 114-124.

TROJAN SPINDLE-WHORLS.

Schliemann, "Ilios."

Leadén idol of Hissarlik.—Dr. Schliemann, in his explorations on the hill of Hissarlik, at a depth of 23 feet, in the third, the burnt city, found a metal idol (fig. 125), which was determined on an analysis to be lead.¹ It was submitted to Professor Sayce who made the following report:²

It is the Artemis Nana of Chaldea, who became the chief deity of Carchemish, the Hittite capital, and passed through Asia Minor to the shores and islands of the Egean Sea. Characteristic figures of the goddess have been discovered at Mycenæ as well as in Cyprus.

In "Troja" Professor Sayce says:

Precisely the same figure, with ringlets on either side of the head, but with a different ornament (dots instead of Swastika) sculptured on a piece of serpentine was recently found in Mæonia, and published by M. Salmon Reinach in *Revue Archæologique*. By the side of the goddess stands the Babylonian Bel, and among the Babylonian symbols that surround them is the representation of one of the terra-cotta whorls, of which Dr. Schliemann found such multitudes at Troy.

The chief interest to us of Dr. Schliemann's description of the idol lies in the last paragraph:³

The vulva is represented by a large triangle, in the upper side of which we see three globular dots; we also see two lines of dots to the right and left of the vulva. The most curious ornament of the figure is a Swastika, which we see in the middle of the vulva. * * * So far as we know, the only figures to which the idol before us has any resemblance are the female figures of white marble found in tombs in Attica and in the Cyclades. Six of them, which are in the museum at Athens, * * * represent naked women. * * * The vulva is represented on the six figures by a large triangle. * * * Similar white Parian marble figures, found in the Cyclades, whereon the vulva is represented by a decorated triangle, are preserved in the British Museum. Lenormant, in "Les Antiquités de la Troade" (p. 46), says: "The statuettes of the Cyclades, in the form of a naked woman, appear to be rude copies made by the natives, at the dawn of their civilization, from the images of the Asiatic goddess which had been brought by Phœnician merchants. They were found in the most ancient sepulchers of the Cyclades, in company with stone weapons, principally arrowheads of obsidian from Milo, and with polished pottery without paintings. We recognize in them the figures of the Asiatic Venus found in such large numbers from the banks of the Tigris to the island of Cyprus, through the whole extent of the Chaldeo-Assyrian, Aramæan, and Phœnician world. Their prototype is the Babylonian Zarpanit, or Zirbanit, so frequently represented on the cylinders and by terra-cotta idols, the fabrication of which begins in the most primitive time of Chaldea and continues among the Assyrians.



Fig. 125.

LEADEN IDOL OF ARTEMIS NANA OF CHALDEA, WITH SWASTIKA.⁴

Third city. Depth, 23 feet.

Schliemann, "Ilios," fig. 126

1½ natural size.

¹"Ilios," fig. 226, p. 337.

²Ibid, p. 694.

³Ibid, p. 338.

⁴See p. 795.

It is to be remarked that this mark is not on the vulva, as declared by Schliemann, but rather on a triangle shield which covers the *mons veneris*.

Professor Sayce is of the opinion, from the evidence of this leaden idol, that the Swastika was, among the Trojans, a symbol of the generative power of man.

An added interest centers in these specimens from the fact that terra-cotta shields of similar triangular form, fitted to the curvature of the body, were worn in the same way in prehistoric times by the aboriginal women of Brazil. These pieces have small holes at the angles, apparently for suspension by cords. The U. S. National Museum has some of these, and they will be figured in the chapter relating to Brazil. The similarity between these distant objects is remarkable, whether they were related or not, and whether the knowledge or custom came over by migration or not.

Owl-shaped vases.—It is also remarkable to note in this connection the series of owl-shaped terra-cotta vases of the ruined cities of

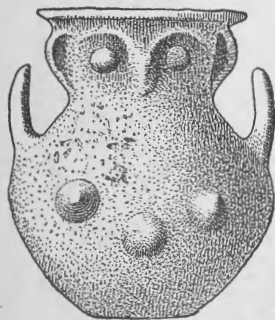


Fig. 126.

TERRA-COTTA VASE WITH MAMELON.

Fourth city. Depth, 16.5 feet.

Cat. No. 149676, U. S. N. M.

$\frac{1}{2}$ natural size.

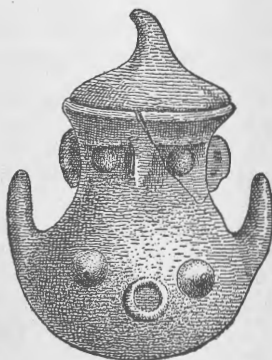


Fig. 127.

TERRA-COTTA VASE WITH CIRCLE OR RING.

Fourth city. Depth, 20 feet.

Schliemann, "Ilios," fig. 968.

$\frac{1}{2}$ natural size.

Hissarlik and their relation to the Swastika as a possible symbol of the generative power. These vases have rounded bottoms, wide bellies, high shoulders (the height of which is emphasized by the form and position of the handles), the mouth narrow and somewhat bottle-shaped, but not entirely so. What would be the neck is much

larger than usual for a bottle, and more like the neck of a human figure, which the object in its entirety represents in a rude, but, nevertheless, definite, manner. At the top of the vase are the eyes, eyebrows, and the nose. It is true that the round eyes, the arched eyebrows, and the pointed nose give it somewhat an owl's face, but if we look at fig. 127, the human appearance of which is emphasized by the cover of the vase, which serves as a cap for the head and has the effect of enlarging it to respectable dimensions, we will see how nearly it represents a human being. The U. S. National Museum possesses one of these vases in the Schliemann collection (fig. 126). It has the face as described, while the other human organs are only indicated by small knobs. It and the three figures, 127, 128, and 129, form a series of which the one in the Museum would be the first, the others following in the order named.

No. 2 in the series has the female attributes indefinitely and rudely indicated, the lower organ being represented by a concentric ring. In No. 3 the mammæ are well shown, while the other organ has the concentric ring, the center of which is filled with a Greek cross with four dots, one in each angle, the *Croix swasticale* of Zmigrodzki (fig. 12). No. 4 of the series is more perfect as a human, for the mouth is represented by a circle, the mammæ are present, while in the other locality appears a well-defined Swastika. The first three of these were found in the fourth city at 20 to 22 feet depth, respectively; the last was found in the fifth city at a depth of 10 feet. The leaden idol (fig. 125), with its Swastika mark on the triangle covering the private parts, may properly be considered as part of the series. When to this series is added the *folium vitus* of Brazil (pl. 18), the similarity becomes significant, if not mysterious. But, with all this significance and mystery, it



Fig. 128.

TERRA-COTTA VASE WITH CIRCLE OR RING
AND CROIX SWASTICALE.

Schliemann, "Ilios," fig. 986.

$\frac{1}{2}$ natural size.

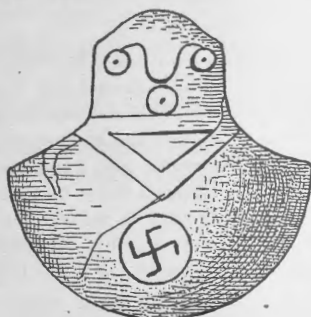


Fig. 129.

TERRA-COTTA VASE WITH CIRCLE OR
RING INCLOSING SWASTIKA.

Schliemann, "Troja," fig. 101.

$\frac{1}{2}$ natural size.

appears to the author that this sign, in its peculiar position, has an equal claim as a symbol of blessing, happiness, good fortune, as that it represents the generative power.

From the earliest time of which we have knowledge of the thoughts or desires of man we know that the raising up "heirs of his body" constituted his greatest blessing and happiness, and their failure his greatest misery. The first and greatest command of God to man, as set forth in the Holy Bible, is to "Be fruitful, and multiply, and replenish the earth."¹ This was repeated after the Deluge,² and when He pronounced the curse in the Garden, that upon the woman³ was, "In sorrow thou shalt bring forth children." God's greatest blessing to Abraham, when He gave to him and his seed the land as far as he could see, was that his seed should be as the dust of the earth, "so that if a

¹ Genesis i, 28.

² Genesis viii, 17; ix, 7.

³ Genesis iii, 16.

man can number the dust of the earth, then shall thy seed also be numbered.”¹ “Tell the stars, if thou be able to number them * * * so shall thy seed be. * * * As the father of many nations,” etc. We all know the story of Sarai, how, when she and Abraham had all riches and power on earth, it was as naught while they were childless, and how their greatest blessing was the Divine promise of an heir, and that their greatest happiness was over the birth of Isaac. This may be no proof of the symbolism of the Swastika, but it shows how, in high antiquity, man’s happiness in his children was such as makes the Swastika mark, in the position indicated, equally a symbol of good fortune and blessing as it was when put on the spindle-whorls of Hissarlik, the vases of Greece, or the fibulæ of Etruria.

The age of the Trojan cities.—It may be well to consider for a moment the age or epoch of these prehistoric Trojan cities on the hill of Hissarlik. Professor Virchow was appealed to by Schliemann for his opinion. He says:²

Other scholars have been inclined to ascribe the oldest cities of Hissarlik to the Neolithic age, because remarkable weapons and utensils of polished stone are found in them. * * * This conception is unjustified and inadmissible. To the third century A. D. belongs the surface of the fortress hill of Hissarlik, which still lies above the Macedonian wall; and the oldest “cities”—although not only polished stones but also chipped flakes of chalcedony and obsidian occur in them—nevertheless fall within the age of metals, for even in the first city utensils of copper, gold, and even silver were dug up. No stone people, properly so called, dwelt upon the fortress hill of Hissarlik, so far as it has been uncovered.

Virchow’s opinion that none of the cities of Hissarlik were in the stone age may be correct, but the reason he gave is certainly doubtful. He says they come within the age of metals, for, or because, “*utensils of copper, gold, and even silver were dug up among the ruins of the first city.*” That the metals, gold, silver, or copper, were used by the aborigines, is no evidence that they were in a metal age, as it has been assigned and understood by prehistoric archæologists. The great principle upon which the names of the respective prehistoric ages—stone, bronze, and iron—were given, was that these materials were used for cutting and similar implements. The use of gold and silver or any metal for ornamental purposes has never been considered by archæologists as synchronous with a metal age. Indeed, in the United States there are great numbers of aboriginal cutting implements of copper, of which the U. S. National Museum possesses a collection of five or six hundred; yet they were not in sufficient number to, and they did not, supersede the use of stone as the principal material for cutting implements, and so do not establish a copper age in America. In Paleolithic times bone was largely used as material for utensils and ornaments. Bone was habitually in use for one purpose or another, yet no one ever pretended that this establishes a bone age. In countries and localities where stone is scarce and shell abundant, cutting

¹ Genesis xiii, 16; xv, 5.

² “Ilios,” preface, p. xi.

implements were, in prehistoric times, made of shell; and chisels or hatchets of shell, corresponding to the polished stone hatchet, were prevalent wherever the conditions were favorable, yet nobody ever called it an age of shell. So, in the ruined cities of Hissarlik, the first five of them abounded in stone implements peculiar to the Neolithic age, and while there may have been large numbers of implements and utensils of other materials, yet this did not change it from the polished stone age. In any event, the reason given by Virchow—i. e., that the use, undisputed, of copper, gold, and silver by the inhabitants of these cities—is not evidence to change their culture status from that denominated as the polished stone age or period.

Professor Virchow subsequently does sufficient justice to the antiquity of Schliemann's discoveries and says¹ while "it is impossible to assign these strata to the stone age, yet they are indications of what is the oldest known settlement in Asia Minor of a people of prehistoric times of some advance in civilization," and² that "no place in Europe is known which could be put in direct connection with any one of the six lower cities of Hissarlik."

Professor Sayce also gives his opinion on the age of these ruins:³

The antiquities, therefore, unearthed by Dr. Schliemann at Troy, acquire for us a double interest. They carry us back to the later stone ages of the Aryan race.

AFRICA.

EGYPT.

A consensus of the opinions of antiquarians is that the Swastika had no foothold among the Egyptians. Prof. Max Müller is of this opinion, as is also Count Goblet d'Alviella.⁴

Waring⁵ says:

The only sign approaching the fylfot in Egyptian hieroglyphics that we have met is shown in fig. 3, pl. 41, where it forms one of the hieroglyphs of Isis, but is not very similar to our fylfot.

Mr. Greg says:⁶ "In Egypt the fylfot does not occur." Many other authors say the same. Yet many specimens of the Swastika have been found in Egypt (figs. 130 to 136). Professor Goodyear,⁷ says:

The earliest dated Swastikas are of the third millenium B. C., and occur on the foreign Cyprian and Carian (?) pottery fragments of the time of the twelfth dynasty (in Egypt), discovered by Mr. Flinders Petrie in 1889. (Kahun, Gurob, and Hawara, pl. 27, Nos. 162 and 173.)

¹ "Ilios," app. 1, p. 685.

² "Ibid.," app. 6, p. 379.

³ "Treja," p. xii.

⁴ "La Migration des Symboles," pp. 51, 52.

⁵ "Ceramic Art in Remote Ages," p. 82.

⁶ "Archæologia, XLVII, pt. 1, p. 159.

⁷ "Grammar of the Lotus," pl. 30, figs. 2 and 10, p. 356.

Naukratis.—Figs. 130 to 135, made after illustrations in Mr. W. Flinders Petrie's Third Memoir of the Egypt Exploration Fund (Pt. 1), found by him in Naukratis, all show

unmistakable Swastikas. It should be explained that these are said to be Greek vases which have been imported into Egypt. So that, while found in Egypt and so classed geographically, they are not Egyptian, but Greek.

Coptos (Achmim-Panopolis).—Within the past few years great discoveries



Fig. 130.

GREEK VASE SHOWING DEER, GEESSE,
AND SWASTIKAS.

Naukratis, Ancient Egypt. Sixth
and fifth centuries, B. C.

Petrie, Third Memoir, Egypt Exploration Fund,
part 1, pl. 4, fig. 3, and Goodyear, "Grammar
of the Lotus," pl. 60, fig. 2.

have been made in Upper Egypt, in Sakkarah, Fayum, and Achmim, the last of which was the ancient city of Panopolis. The inhabitants of Coptos and the surrounding or neighboring cities were Christian Greeks, who migrated from their country during the first centuries of our era and settled in this land of Egypt. Strabo mentions these people and their ability as weavers and embroiderers. Discoveries have been made of their cemeteries, winding sheets, and grave clothes. These clothes have been subjected to analytic investigation, and it is the conclusion of M. Gerspach, the administrator of the national manufactory of the Gobelin tapestry, Paris,¹ that they were woven in the same way as the Gobelins, and that, except being smaller, they did not differ essentially from them. He adds:

These Egyptian tapestries and those of the Gobelins are the result of work which is identical except in some secondary details, so that I have been able, without difficulty, to reproduce these Coptic tapestries in the Gobelin manufactory.

On one of these Coptic cloths, made of linen, reproduced in "Die Gräber- und Textilfunde von Achmim-Panopolis," by R. Forrer, occurs



Fig. 130a.

DETAIL OF VASE SHOWN IN
THE PRECEDING FIGURE.

¹ "Les Tapisseries Coptes," sec. 4, pp. 5, 6.

a normal Swastika embroidered or woven, tapestry fashion, with woolen thread (fig. 136). It belongs to the first epoch, which includes



Fig. 131.

POTTERY FRAGMENTS WITH TWO MEANDER SWASTIKAS.

Naukratis, Ancient Egypt.

Petrie, *Third Memoir of the Egypt Exploration Fund*, part 1, pl. 5, figs. 15, 24.

portions of the first and second centuries A. D. There were on these cloths an enormous amount of decoration, representing many figures,



Fig. 132.

FRAGMENT OF GREEK VASE WITH LION AND THREE MEANDER SWASTIKAS.

Naukratis, Ancient Egypt.

Petrie, *Sixth Memoir of the Egypt Exploration Fund*, part 2, fig. 7, and Goodyear, "*Grammar of the Lotus*," pl. 30, fig. 2.

both natural and geometric. Among them was the Swastika variously applied and in different sizes, sometimes inserted in borders, and



Fig. 133.

FRAGMENT OF GREEK VASE DECORATED WITH FIGURES OF SACRED ANIMALS AND SWASTIKAS, ASSOCIATED WITH GREEK FRET.

Naukratis, Ancient Egypt.

Petrie, Sixth Memoir of the Egypt Exploration Fund, part 2, pl. 6, fig. 1.



Fig. 134.

FRAGMENT OF GREEK VASE WITH FIGURES OF ANIMALS, TWO MEANDER SWASTIKAS, AND GREEK FRET.

Naukratis, Ancient Egypt.

Petrie, Sixth Memoir of the Egypt Exploration Fund, part 2, pl. 8, fig. 1, and Goodyear, "Grammar of the Lotus," pl. 30, fig. 10.



Fig. 135.

GREEK VASE WITH DEER, AND MEANDER AND FIGURE-8 SWASTIKAS.

Naukratis, Ancient Egypt.

Petrie, Sixth Memoir of the Egypt Exploration Fund, part 2, pl. 5, fig. 1.

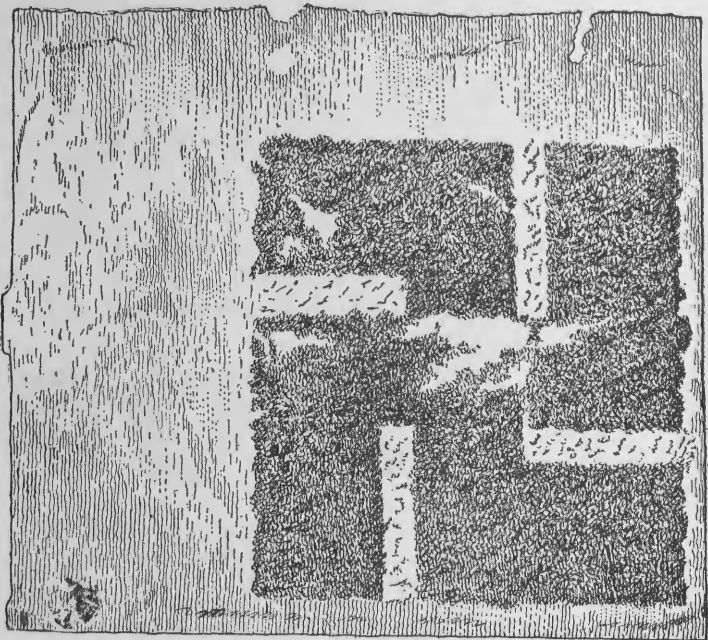


Fig. 136.

GREEK TAPESTRY.

Coptos, Egypt. First and second centuries, A. D.

Forrer, "Die Gräber- und Textilfunde von Achmia-Panopolis."

sometimes adorning the corners of the tunics and togas as a large medallion; as shown in the figure.¹

ALGERIA.

Waring, in his "Ceramic Art in Remote Ages," discoursing upon the Swastika, which he calls fylfot, shows in pl. 43, fig. 2 (quoting from Dela-

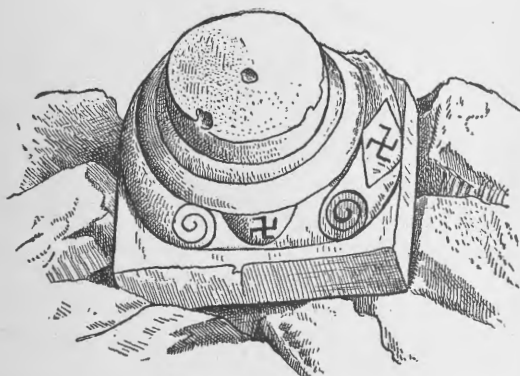


Fig. 137.

TORUS OF COLUMN WITH SWASTIKAS.

Roman ruins, Algeria.

Waring, "Ceramic Art in Remote Ages," pl. 43, fig. 2, quoting from Delamare.

mare), the base of a column from a ruined Roman building in Algeria (fig. 137), on the torus of which are engraved two Swastikas, the arms crossing at right angles, all ends bent at right angles to the left. There are other figures (five and six on the same plate) of Swastikas from a Roman mosaic pavement in Algeria. Instead of being square, however, or at right angles, as might ordinarily be expected from mosaic, they are ogee. In one of the specimens the ogee ends finish in a point; in the other they finish in a spiral volute turning upon itself. The Swastika has been found on a tombstone in Algeria.²

ASHANTEE.

Mr. R. B. Æneas McLeod, of Invergordon Castle, Ross-shire, Scotland, reported³ that, on looking over some curious bronze ingots captured at Coomasee in 1874, during the late Ashantee war, by Captain Eden, in whose possession they were at Inverness, he had found some marked with the Swastika sign (fig. 138). These specimens were claimed to be aboriginal, but whether the marks were cast or stamped in the ingot is not stated.



Fig. 138.

BRONZE INGOTS BEARING SWASTIKAS.

Coomasee, Ashantee.

¹ Forrer, "Die Gräber- und Textilfunde von Achmim-Panopolis," p. 20.

² Bull. Soc. Française de numism. et d'archéol., II, pl. 3, p. 3.

³ "Ilios," p. 353.

CLASSICAL OCCIDENT—MEDITERRANEAN.

GREECE AND THE ISLANDS OF CYPRUS, RHODES, MELOS, AND THERA.

The Swastika has been discovered in Greece and in the islands of the Archipelago on objects of bronze and gold, but the principal vehicle was pottery; and of these the greatest number were the painted vases. It is remarkable that the vases on which the Swastika appears in the

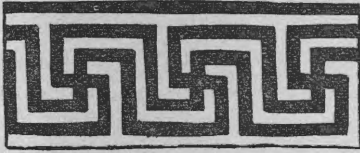


Fig. 139.

VARIATION OF THE GREEK FRET.

Continuous lines crossing each other at right angles forming figures resembling the Swastikas.

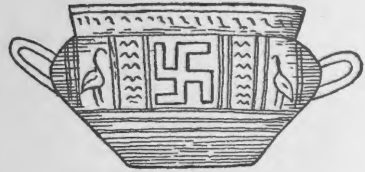


Fig. 140.

GREEK GEOMETRIC VASE IN THE LEYDEN MUSEUM, WITH FIGURES OF GESE AND SWASTIKA IN PANEL.¹

Smyrna.

Conze, "Anfänge," etc., Vienna, 1870, and Goodyear, "Grammar of the Lotus," pl. 56, fig. 4.

largest proportion should be the oldest, those belonging to the Archaic period. Those already shown as having been found at Naukratis, in Egypt, are assigned by Mr. Flinders Petrie to the sixth and fifth centuries B. C., and their presence is accounted for by migrations from Greece.

The Greek fret and Egyptian meander not the same as the Swastika.—Professor Goodyear says:² "There is no proposition in archæology which can be so easily demonstrated as the assertion that the Swastika is originally a fragment of the Egyptian meander, provided Greek geometric vases are called in evidence."

Egyptian meander here means the Greek fret. Despite the ease with which he says it can be demonstrated that the Swastika was originally a fragment of the Egyptian meander,

and with all respect for the opinion of so profound a student of classic ornament, doubts must arise as to the existence of the evidence necessary to prove his proposition.



Fig. 141.

GREEK VASE WITH FIGURES OF HORSES, GEOMETRIC ORNAMENT'S AND SWASTIKAS IN PANELS. Athens.

Dennis, "Etruria," I, p. cxlii.



Fig. 142.

GREEK VASE WITH SWASTIKAS IN PANELS.

Conze, "Anfänge," etc., and Goodyear, "Grammar of the Lotus," pl. 60, fig. 13.

¹ See p. 845.

² "Grammar of the Lotus," p. 352.

Professor Goodyear, and possibly others, ascribe the origin of the Swastika to the Greek fret; but this is doubtful and surely has not been proved. It is difficult, if not impossible, to procure direct evidence on the proposition. Comparisons may be made between the two signs; but this is secondary or indirect evidence, and depends largely on argument. No man is so poor in expedients that he may not argue. Goldsmith's schoolmaster "e'en tho' vanquished, he could argue still." The Greek fret, once established, might easily be doubled or crossed in some of its members, thus forming a figure similar to the Swastika (fig. 139), which would serve as an ornament, but is

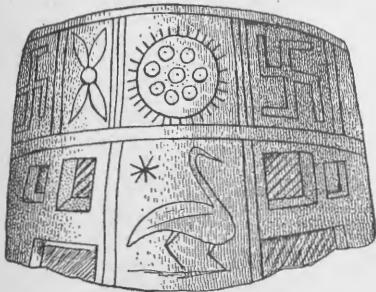


Fig. 143.

DETAIL OF ARCHAIC GREEK VASE WITH FIGURE OF SOLAR GOOSE AND SWASTIKAS IN PANELS.

British Museum.

Waring, "Ceramic Art in Remote Ages," pl. 41, fig. 15.

without any of the characteristics of the Swastika as a symbol. The

crossed lines in the Greek fret seem to have been altogether fortuitous. They gave it no symbolic character. It was simply a variation of the fret, and at best was rarely used, and like it, was employed only for ornament and not with any signification—not a sign of benediction, blessing, or good luck,

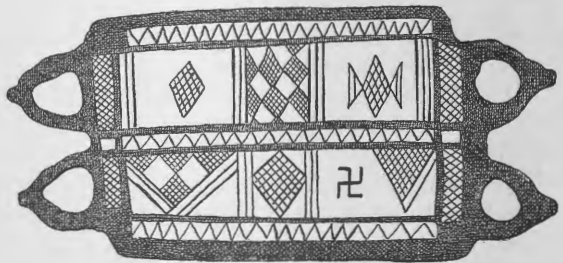


Fig. 144.

CYPRIAN POTTERY PLAQUE WITH SWASTIKA IN PANEL.

Metropolitan Museum of Art, New York City.

Cesnola, "Cyprus, its Ancient Cities, Tombs, and Temples," pl. 47, fig. 40.

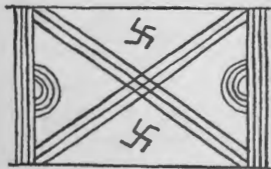


Fig. 145.

DETAIL OF CYPRIAN VASE WITH SWASTIKAS IN TRIANGLES.

Goodyear, "Grammar of the Lotus," pl. 1, fig. 11.

used, crossing each other at certain places, both making continuous meanders and together forming the ornamental band (fig. 139). In the Greek fret the two lines meandered between the two borders back and forth, up and down, but always forming a continuous line. This seems to be the foundation principle of the Greek fret. In all this

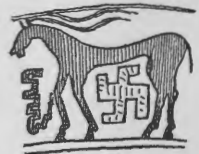


Fig. 146.

DETAIL OF ATTIC VASE WITH FIGURE OF ANTELOPE(?) AND SWASTIKA.

British Museum.

Bohlau, Jahrbuch, 1885, p. 50, and Goodyear, "Grammar of the Lotus," pl. 37, fig. 9.

requirement or foundation principle the Swastika fails. A row or band of Swastikas can not be made by continuous lines; each one is and must be separated from its fellows. The Swastika has four arms, each made by a single line which comes to an end in each quarter. This is more imperative with the meander Swastika than with the normal. If the lines be doubled on

each other to be carried along to form another Swastika adjoining, in the attempt to make a band, it

will be found impossible. The four lines from each of the four arms can be projected, but each will be in a different direction, and no band can be made. It is somewhat difficult to describe this, and possibly not of great need. An attempt to carry out the project of making a band of Swastikas, to be connected with each other, or to make them travel in any given direction with continuous lines, will be found impossible.



Fig. 148.

TERRA COTTA FIGURINE WITH SWASTIKAS IN PANELS.

Cesnola, "Cyprus, its Ancient Cities, Tombs, and Temples," p. 300, and Ohnefalsch-Richter, Bull. Soc. d'Anthrop., Paris, 1888, p. 681.

Professor Goodyear attempts to show how this is done by his figure on page 96, in connection with pl. 10, fig. 9, also figs. 173 and 174 (pp. 353 and 354). These figures are given in this paper and are, respectively, Nos. 21, 25, 26, and 27. Exception is taken to the pretended

line of evolution in these figures: (1) There

is nothing to show any actual relationship between them. There is no evidence that they agreed either in locality or time, or that there was any unity of thought or design in



Fig. 147.

CYPRIAN VASE WITH SWASTIKAS.

Cesnola, "Cyprus, its Ancient Cities, Tombs, and Temples," appendix by Murray, p. 404, fig. 15.



Fig. 149.

TERRA COTTA VASE WITH SWASTIKA AND FIGURE OF HORSE.¹



Fig. 150.

BRONZE FIBULA WITH SWASTIKA AND REPRESENTATIONS OF A GOOSE AND A FISH.

Boeotia, Greece.

De Mortillet, "Musée Préhistorique," fig. 1265.

¹ Goodyear, "Grammar of the Lotus," pl. 61, fig. 1.

the minds of their respective artists. (2) Single specimens are no evidence of custom. This is a principle of the common law which has

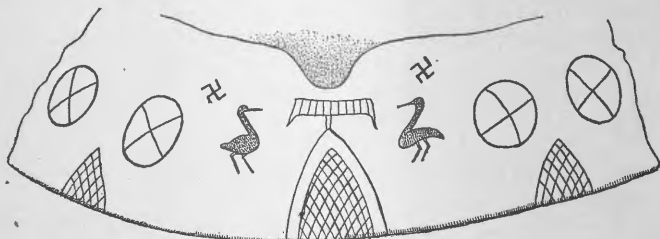


Fig. 151.

DETAIL OF GREEK VASE WITH SWASTIKAS AND FIGURES OF BIRDS.

Waring, "Ceramic Art in Remote Ages," pl. 33, fig. 24, and Goodyear, "Grammar of the Lotus," pl. 46, fig. 5.

still a good foundation, and was as applicable in those days as it is now. The transition from the spiral to the Greek fret and from the



Fig. 152.

DETAIL OF CYPRIAN VASE.

Sunhawk, lotus, solar disk, and Swastikas.

Böhlau, Jahrbuch, 1886, pl. 8; Reinach Revue Archæologique, 1885, II, p. 360; Perrot and Chipiez, "History of Art in Phœnicia and Cyprus," II; Goodyear, "Grammar of the Lotus," pl. 48, fig. 3.

Greek fret to the Swastika can be shown only by the existence of the custom or habit of the artist to make them both in the same or adjoin-

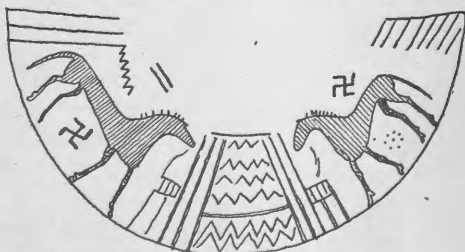


Fig. 153.

DETAIL OF GREEK GEOMETRIC VASE WITH SWASTIKAS AND FIGURES OF HORSES.

Thera.

Leyden Museum.

Goodyear, "Grammar of the Lotus," pl. 61, fig. 4.

ing epochs of time, and this is not proved by showing a single specimen. (3) If a greater number of specimens were produced, the chain of

evidence would still be incomplete, for the meander of the Greek fret will, as has just been said, be found impossible of transition into the meander Swastika. It (the Swastika) does not extend itself into a band, but if spread at all, it spreads in each of the four directions (figs. 21 and 25). The transition will be found much easier from the Greek meander fret to the normal Swastika and from that to the meander Swastika than to proceed in the opposite direction. Anyone who doubts this has

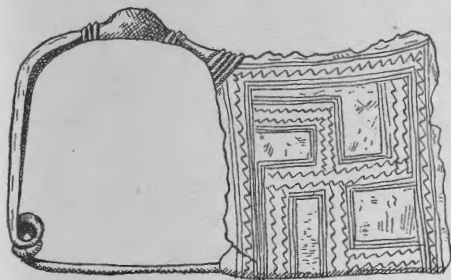


Fig. 154.

BRONZE FIBULA WITH LARGE SWASTIKA ON SHIELD.
Greece.

Musée St. Germain.

De Mortillet, "Musée Préhistorique," fig. 1264.
 $\frac{1}{2}$ natural size.



Fig. 155.

GREEK VASE, OINOCHOË, WITH
TWO PAINTED SWASTIKAS.

De Mortillet, "Musée Préhistorique,"
fig. 1944.
 $\frac{1}{4}$ natural size.

but to try to make the Swastika in a continuous or extended band or line (fig. 26), similar to the Greek fret.

Figs. 133 and 134, from Naukratis, afford palpable evidence of the different origin of the Swastika and the Greek fret. Evidently Grecian vases, though found in Egypt, these specimens bear side by side examples of the fret and the Swastika used contemporaneously, and



Fig. 156.

CYPRIAN VASE WITH SWASTIKAS AND FIGURE
OF ANIMAL.¹

Cesnola, "Cyprus, its Ancient Cities, Tombs, and Temples,"
pl. 45, fig. 36.



Fig. 157.

ARCHAIC GREEK POTTERY FRAGMENT.
Santorin, Ancient Thera.

Waring, "Ceramic Art in Remote Ages," pl. 42,
fig. 2.

both of them complete and perfect. If one had been parent of the other, they would have belonged to different generations and would not have appeared simultaneously on the same specimen. Another illustration of simultaneous use is in fig. 194, which represents an Etruscan vase² ornamented with bronze nail heads in the form of

¹ See p. 795.

² Matériaux pour l'Histoire Primitive et Naturelle de l'Homme, XVIII, p. 14.

Swastikas, but associated with it is the design of the Greek fret, showing them to be of contemporaneous use, and therefore not, as Professor



Fig. 158.

CYPRIAN VASE WITH LOTUS AND SWASTIKAS AND FIGURE OF BIRD.

Metropolitan Museum of Art, New York City.

Goodyear, "Grammar of the Lotus," pl. 60, fig. 15.

Goodyear believes, an evolution of one from the other. The specimen is in the Museum at Este, Italy.



Fig. 159.

CYPRIAN VASE WITH TWO SWASTIKAS.

Cesnola Collection, Metropolitan Museum of Art, New York City.

Goodyear, "Grammar of the Lotus," fig. 151.

The Greek fret has been in common use in all ages and all countries adopting the Grecian civilization. Equally in all ages and countries has

appeared the crossed lines which have been employed by every architect and decorator, most or many of whom had no knowledge of the Swastika, either as an ornament or as a symbol.¹

Swastika in panels.—Professor Goodyear, in another place,² argues in a manner which tacitly admits the foregoing proposition, where, in his endeavor to establish the true home of the Swastika to be in the Greek geometric style, he says we should seek it where it appears in “the largest dimension” and in “the most prominent way.” In verification of this declaration, he says that in this style the Swastika systematically appears in panels exclusively assigned to it. But he gives only



Fig. 161.

WOODEN BUTTON, CLASP, OR FIBULA COVERED WITH PLATES OF GOLD.

Ogee Swastika, tetraskelion in center.

Schliemann, “Mycenae,” fig. 385.

Cesnola and Ohnefalsch-Richter: It might be too much to say that these are the only Swastikas in Greece appearing in panels, but it is certain that the great majority of them do not thus appear. Therefore, Professor Goodyear’s theory is not sustained, for no one will pretend that four specimens found in panels will form a rule for the great number which did not thus appear. This argument of Professor Goodyear is destructive of his other proposition that the Swastika sign originated by evolution from the meander or Greek fret, for we have seen that the latter was always used in a band



Fig. 160.

FRAGMENT OF TERRA COTTA VASE WITH SWASTIKAS, FROM RUINS OF TEMPLE AT PALEO-PAPHOS.

Depth, 40 feet.

Cesnola, “Cyprus, its Ancient Cities, Tombs, and Temples,” p. 210.



Fig. 162.

DETAIL OF GREEK VASE WITH FIGURE OF GOOSE, HONEYSUCKLE (ANTHEMION), AND SPIRAL SWASTIKA.

Thera.

“Monument Ineditæ,” LXV, p. 2, and Goodyear, “Grammar of the Lotus,” pl. 46, fig. 7.

¹Athenic vases painted by Andokides, about 525 B. C., represent the dress of the goddess, ornamented with Swastika and *Croix swasticale*. Am. Journ. Archæol., January-March, 1896, XI, No. 1, figs. 9, 11.

²“Grammar of the Lotus,” pp. 348, 353.

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WOODEN BUTTON, CLASP, OR FIBULA COVERED WITH PLATES OF GOLD.

Ogee Swastika, tetraskelion in center.

Schliemann, “Mycene,” fig. 385.

Cesnola and Ohnefalsch-Richter: It might be too much to say that these are the only Swastikas in Greece appearing in panels, but it is certain that the great majority of them do not thus appear. Therefore, Professor Goodyear’s theory is not sustained, for no one will pretend that four specimens found in panels will form a rule for the great number which did not thus appear. This argument of Professor Goodyear is destructive of his other proposition that the Swastika sign originated by evolution from the meander or Greek fret, for we have seen that the latter was always used in a band



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Depth, 40 feet.

Cesnola, “Cyprus, its Ancient Cities, Tombs, and Temples,” p. 210.



Fig. 162.

DETAIL OF GREEK VASE WITH FIGURE OF GOOSE, HONEYSUCKLE (ANTHEMION), AND SPIRAL SWASTIKA.

Thera.

“Monumenti Inedite,” LXV, p. 2, and Goodyear, “Grammar of the Lotus,” pl. 46, fig. 7.

¹Athenic vases painted by Andokides, about 525 B. C., represent the dress of the goddess, ornamented with Swastika and *Croix swasticale*. Am. Journ. Archæol., January-March, 1896, XI, No. 1, figs. 9, 11.

²“Grammar of the Lotus,” pp. 348, 353.

and never in panels. Although the Swastika and the Greek fret have a certain similarity of appearance in that they consist of straight lines bent at right angles, and this continued many times, yet the similarity



Fig. 163.

DETAIL OF GREEK VASE.

Sphinx with spiral scrolls, and two meander Swastikas (right).

Melos.

Bühlau, Jahrbuch, 1887, xii, and Goodyear, "Grammar of the Lotus," pl. 34, fig. 8.



Fig. 164.

DETAIL OF GREEK VASE.

Ibex, scroll, and meander Swastika (right).

Melos.

Bühlau, Jahrbuch, 1887, xii, p. 121, and Goodyear, "Grammar of the Lotus," pl. 39, fig. 2.

is more apparent than real; for an analysis of the motifs of both show them to have been essentially different in their use, and so in their foundation and origin.



Fig. 165.

DETAIL OF A GREEK VASE IN THE BRITISH MUSEUM.

Ram, meander Swastika (left), circles, dots, and crosses.

Salzmann, "Necropole de Camire," li, and Goodyear, "Grammar of the Lotus," pl. 28, fig. 7.

Swastikas with four arms, crossing at right angles, with ends bent to the right.—The author has called this the normal Swastika. He has been at some trouble to gather such Swastikas from Greek vases as was

possible, and has divided them according to forms and peculiarities. The first group (figs. 140, 143, 146, 147, 148, and 150) shows the normal Swastika with four arms, all bent at right angles and to the right. In the aforesaid division no distinction has been made between specimens from different parts of Greece and the islands of the Grecian Archi-



Fig. 166.

CYPRIAN VASE WITH SWASTIKAS AND FIGURES OF BIRDS.

Perrot and Chipiez, "History of Art in Phenicia and Cyprus," II, p. 200, fig. 237; Goodyear, "Grammar of the Lotus," pl. 48, figs. 6, 12; Cesnola, "Cyprus, its Ancient Cities, Tombs, and Temples," Appendix by Murray, p. 412, pl. 44, fig. 34.

pelago, and these, with such specimens as have been found in Smyrna, have for this purpose all been treated as Greek.

Swastikas with four arms crossing at right angles, ends bent to the left.—Figs. 141, 142, 144, 149, 151, 152, 153, 154, 156, and 157 represent the normal Swastika with four arms, all bending at right angles, but to the left. The vases on which they have been found are not described as to color or form. It would be difficult to do so correctly; besides, these descriptions are not important in our study of the Swastika. Fig. 155 represents a vase or pitcher (oinochoë, Greek—*οἶνος*, wine, and *χέω*, to pour) with painted Swastika, ends turned to the left. It is in the Museum of St. Germain, and is figured by M. De Mortillet in "Musée Pré-historique." Fig. 156 represents a Cyprian vase from Ormidia, in the New York Museum. It is described by Cesnola¹ and by Perrot and Chipiez.² Fig. 157 is taken from a fragment of archaic Greek pottery found in Santorin (Ancient Thera), an island in the



Fig. 167.

CYPRIAN VASE WITH LOTUS, BOSSES, BUDS, SEPALS, AND DIFFERENT SWASTIKAS.

Cesnola Collection, Metropolitan Museum of Art, New York City.

Goodyear, "Grammar of the Lotus," pl. 48, fig. 3.

¹ "Cyprus, its Ancient Cities, Tombs, and Temples," pl. 45, fig. 36.

² "History of Art in Phenicia and Cyprus," II, p. 302, fig. 239.

Greek Archipelago. This island was first inhabited by the Phœnicians, afterwards by the Greeks, a colony of whom founded Cyrene in Africa. This specimen is cited by Rochette and figured by Waring.¹

Swastikas with four arms crossing at other than right angles, the ends ogee and to the left.—Figs. 158, 159, and 160 show Swastikas with four



Fig. 168.

CYPRIAN VASE WITH BOSSES, LOTUS BUDS, AND DIFFERENT SWASTIKAS.

Cesnola Collection, Metropolitan Museum of Art, New York City.

Goodyear, "Grammar of the Lotus," pl. 48, fig. 15.

of the four angles of the cross similar to the *Suavastika* of Max Müller and the *Croix swasticale* of Zmigrodzki, which Burnouf attributed to the four nails which fastened the cross *Arani* (the female principle), while the *Pramantha* (the male), produced, by rotation, the holy fire from the sacred cross. An almost exact reproduction of this Swastika will be found on the shield of the Pima Indians of New Mexico (fig. 258).

Dr. Schliemann reports that the Swastika in its spiral form is represented innumerable times in the sculptured ceiling of the *Thalamos* in the treasury at Orchomenos. (See figs. 21 and 25.)

He also reports² that Swastikas (turned both ways) may be seen in the Royal Museum at Berlin incised on a balustrade relief of the hall which surrounded the temple of Athene at Pergamos. Fig. 162 represents a spiral Swastika with four arms crossing at right angles, the ends all turned to the left and each one forming a spiral.

arms crossing at other than right angles, many of them ogee, but turned to the left. Fig. 161 is a representation of a wooden button or clasp, much resembling the later gold brooch of Sweden, classified by Montelius (p. 867), from Sepulcher IV, Mycenæ (Schliemann, Mycenæ, fig. 385, p. 259). The ornament in its center is one of the ogee Swastikas with four arms (tetraskelion) curved to the left. It shows a dot in each



Fig. 169.

DETAIL OF EARLY BEOTIAN VASE.

Figure of horse, solar diagram, Artemis with geese, and Swastikas (normal and meander, right and left).

Goodyear, "Grammar of the Lotus," pl. 61, fig. 12.

¹ "Ceramic Art in Remote Ages," pl. 42, fig. 2.

² "Troja," p. 123.

Waring¹ figures and describes a Grecian oinochoë from Camirus, Rhodes, dating, as he says, from 700 to 500 B. C., on which is a band of decoration similar to fig. 130. It is about 10 inches high, of cream color, with ornamentation of dark brown. Two ibexes follow each other with an ogee spiral Swastika between the forelegs of one.

Meander pattern, with ends bent to right and left.—Figs. 163, 164, and 165 show the Swastika in meander pattern. Fig. 163 shows two Swastikas, the arms of both bent to the right, one six, the other nine times. The Swastika shown in fig. 164 is bent to the right eight times. That shown in fig. 165 bends to the left eight times.

Swastikas of different kinds on the same object.—The next group (figs. 167 to 176) is of importance in that it represents objects which, bearing the

normal Swastika, also show on the same object other styles of Swastika, those turned to the left at right angles, those at other than right angles, and those which are spiral or meander. The presence on a single object of different forms of Swastika is considered as evidence of their chronologic identity and their consequent relation to each other, showing them to be all the same sign—that is, they were all Swastikas,



Fig. 170.

DETAIL OF RHODIAN VASE.

Figures of geese, circles and dots, and Swastikas (right and left).
British Museum.

Waring, "Ceramic Art in Remote Ages," pl. 27, fig. 9.



Fig. 171.

DETAIL OF RHODIAN VASE.

Geese, lotus circles, and two Swastikas (right and left).

Goodyear, "Grammar of the Lotus," p. 271, fig. 145.

whether the arms were bent to the right or to the left, ogee or in curves, at right angles or at other than right angles, in spirals or meanders.

Many examples of vases similar to fig. 172 are shown in the London, Paris, and New York museums, and in other collections. (See figs. 149, 159.) Fig. 174 shows an Attic painted vase (*Lebes*) of the Archaic period, from Athens. It is a pale yellowish ground, probably the

¹ "Ceramic Art in Remote Ages," frontispiece, fig. 3, and p. 115.

natural color, with figures in maroon. It belongs to the British Museum. It bears on the front side five Swastikas, all of different styles; three turn to the right, two to the left. The main arms cross at right angles, but the ends of four are bent at right angles, while one is curved (ogee). Three have the ends bent (at right angles) four times, making a meander form, while two make only one bend. They seem not to be placed with any reference to each other, or to any other object, and are



Fig. 172.

GREEK VASE OF TYPICAL RHODIAN STYLE.

Thex, lotus, geese, and six Swastikas (normal, meander, and ogee, all left).

Goo1year, "Grammar of the Lotus," p. 251, pl. 38.¹

scattered over the field as chance or luck might determine. A specimen of Swastika interesting to prehistoric archæologists is that on a vase from Cyprus (Musée St. Germain, No. 21557), on which is represented an arrowhead, stemmed, barbed, and suspended by its points between the Swastika.²

Dr. Max Ohnefalsch-Richter presented a paper before the Société

¹ Another Rhodian vase, similar in style, with Swastikas, is shown in the "Grammar of the Lotus," pl. 37, fig. 4.

² Matériaux pour l'histoire Primitive et Naturelle de l'Homme, 1881, xvi, p. 416

d'Anthropologie in Paris, December 6, 1888, reported in the Bulletin of that year (pp. 668-681). It was entitled "La Croix gammée et la Croix cantonnée en Chypre." (The *Croix gammée* is the Swastika, while the *Croix cantonnée* is the cross with dots, the *Croix swasticale* of Zmigrodzki.) In this paper the author describes his finding the Swastika during his excavations into prehistoric Cyprus. On the first page of his paper the following statement appears:

The Swastika comes from India as an ornament in form of a cone (*conique*) of metal, gold, silver, or bronze gilt, worn on the ears (see G. Perrot: "Histoire de l'Art," III, p. 562 et fig. 384), and nose-rings (see S. Reinach: "Chronique d'Orient,"

3^e série, t. IV, 1886). I was the first to make known the nose-ring worn by the goddess Aphrodite-Astarte, even at Cyprus. In the Indies the women still wear these ornaments in their nostrils and ears. The fellahin of Egypt also wear similar jewelry; but as Egyptian art gives us no example of the usage of these ornaments in



Fig. 173.

DETAIL OF GREEK VASE.

Deer, solar diagrams, and three Swastikas (single, double, and meander, right).

Melos.

Conze, "Meliosche Thongefässe," and Goodyear, "Grammar of the Lotus," pl. 60, fig. 8.



Fig. 174.

ARCHAIC GREEK VASE WITH FIVE SWASTIKAS OF FOUR DIFFERENT FORMS.

Athens.

Birch, "History of Ancient Pottery," quoted by Waring in "Ceramic Art in Remote Ages," pl. 41, fig. 16; Dennis, "The Cities and Cemeteries of Etruria," I, p. 91.

antiquity, it is only from the Indies that the Phenicians could have borrowed them. The nose-ring is unknown in the antiquity of all countries which surrounded the island of Cyprus.

The first pages of his memoir are employed in demonstrating that

the specimens of the Swastika found in Cyprus, the most of which are set forth in this paper (figs. 177-182), show a Phœnician influence; and according to his theory demonstrate their migration or importation. He does not specify the evidence on which he bases his assertion of Phœnician influence in Cyprus, except in one or two particulars. Speaking of the specimen shown in fig. 177 of the present paper, he says:

It represents the sacred palm under which Apollo, the god of light, was born. * * * At Cyprus the palm did not appear only with the Phœnicians; it was not known prior to that time (p. 674).

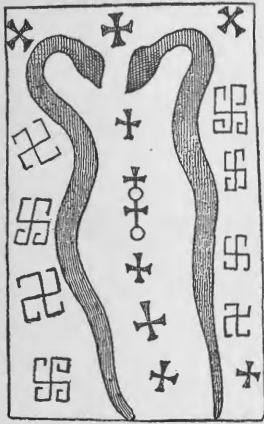


Fig. 175.

DETAIL OF ARCHAIC BŒOTIAN VASE.

Serpents, crosses, and Swastikas (normal, right, left, and meander).

Goodyear, "Grammar of the Lotus," pl. 60, fig. 9.

The design shown in fig. 178 he describes as representing two birds in the attitude of adoration before a Swastika, all being figured on a Greek cup of the style Dipylon.¹

Dr. Ohnefalsch-Richter adds:

On the vases of Dipylon the Swastikas are generally transformed into other ornaments, mostly meanders. But this is not the rule in Cyprus. The Swastika disappeared from there as it came, in its sacred form, with the Phœnician influence, with the Phœnician inscriptions on the vases, with the concentric circles without central points or tangents.

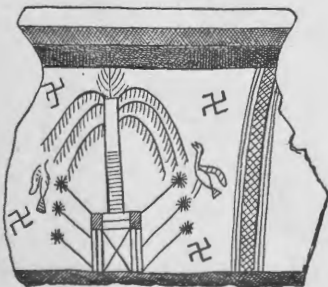


Fig. 177.

DETAIL OF CYPRIAN VASE.

Swastikas with palm tree, sacred to Apollo. Cítium, Cyprus.

Ohnefalsch-Richter, Bull. Soc. d'Anthrop., Paris, 1888, p. 673, fig. 8.



Fig. 176.

ATTIC VASE FOR PERFUME, WITH CROIX SWASTICALE AND TWO FORMS OF SWASTIKAS.

Ohnefalsch-Richter, Bull. Soc. d'Anthrop., Paris, 1888, p. 673, fig. 4.

He says² that the Swastika as well as the "Croix cantonnée" (with points or dots), while possibly not always the equivalent of the solar disk, zigzag lightning, or the double hatchet, yet are employed together and are given the same signification, and frequently replace each other. It is his opinion³ that the Swastika in Cyprus had nearly

¹G. Hirschfeld, "Vasi archaici Ateniesi," *Annali dell' Instituto di corrispondenza archæologica*, 1872, Tav. d'Ag. K. 6, 52.

²Bull. Soc. d'Anthrop., Paris, 1888, pp. 674-675.

³Ibid., p. 675.

always a signification more or less religious, although it may have been used as an ornament to fill empty spaces. His interpretation of the Swastika in Cyprus is that it will signify *tour à tour* the storm, the lightning, the sun, the light, the seasons—sometimes one, sometimes another of these significations—and that its form lends itself easily (*facilement*) to the solar disk, to the fire wheel, and to the sun chariot. In support of this, he cites a figure (fig. 179) taken from Cesnola,¹ in which the

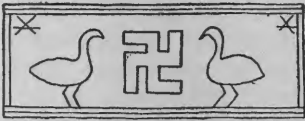


Fig. 178.

CYPRIAN VASE WITH FIGURES OF BIRDS AND SWASTIKA IN PANEL.

Musée St. Germain.

Ohnefalsch-Richter, Bull. Soc. d'Anthrop., Paris, 1888, p. 674, fig. 6.

wheels of the chariot are decorated with four Swastikas displayed in each of the four quarters. The chief personage on the car he identifies as the god of Apollo-Resef, and the decoration on his shield represents the solar disk. He is at once the god of war and also the god of light, which identifies him with Helios. The other personage is Herakles-Mecquars, the right hand of Apollo, both of them heroes of the sun.

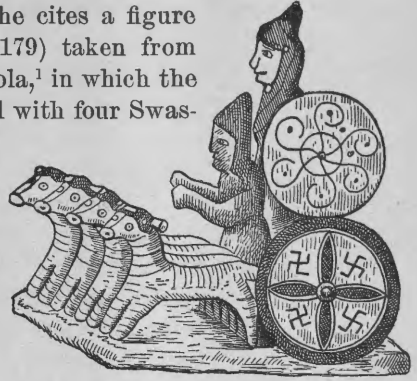


Fig. 179.

CHARIOT OF APOLLO-RESEF.

Sun symbol (?) on shield and four Swastikas (two right and two left) on quadrants of chariot wheels.

Cesnola, "Salaminia," p. 240, fig. 226, and Ohnefalsch-Richter, Bull. Soc. d'Anthrop., Paris, 1888, p. 675, fig. 7.

The supreme goddess of the



Fig. 180.

TERRA-COTTA STATUE OF THE GODDESS APHRODITE-ASTARTE WITH FOUR SWASTIKAS.³

Curium, Cyprus.

Ohnefalsch-Richter, Bull. Soc. d'Anthrop., Paris, 1888, p. 676, fig. 8.

Isle of Cyprus was Aphrodite-Astarte,² whose presence with a preponderating Phenician influence can be traced back to the period of the age of iron, her images bearing signs of the Swastika, being, according to Dr. Ohnefalsch-Richter, found in Cyprus. In fig. 180 the statue of this goddess is shown, which he says was found by himself in 1884 at Curium. It bears four



Fig. 181.

CYPRIAN CENTAUR WITH ONE SWASTIKA.

Cesnola, "Salaminia," p. 243, fig. 230; Ohnefalsch-Richter, Bull. Soc. d'Anthrop., Paris, 1888, p. 676, fig. 9.

Swastikas, two on the shoulders and two on the forearms. Fig. 181 represents a centaur found by him at the same time, on the right arm of which is a Swastika painted in black, as in the foregoing statue.

¹ "Salaminia," p. 240, fig. 226.

² Aphrodite=Phenician Ashtoreth, Astarte=Babylonian Ishtar.

³ See p. 773.

We have found, in the course of this paper, many statues of human figures bearing the mark of the Swastika on some portion of their garments. M. Ohnefalsch-Richter, on page 677, gives the following explanation thereof:

It appears to me that the priests and priestesses, also the boys who performed the services in the sacred places, were in the habit of burning or tattooing Swastikas upon their arms. * * * In 1885, among the votive offerings found in one of the sacred places dedicated to Aphrodite-Astoret, near Idalium, was a stone statuette, representing the young Adonis Kinyras in a squatting posture, with the Swastika tattooed or painted in red color upon his naked arm.



Fig. 182.

GREEK STATUE OF APH-
RODITE-ARIADNE.

Six Swastikas (four
right and two left).

Polistis (Chrysokon.
Ohnefalsch-Richter, Bull. Soc.
d'Anthrop., Paris, 1888, p.
677, fig. 10.

And, says Richter, when, later on, the custom of tattooing had disappeared, they placed the Swastika on the sacerdotal garments. He has found in a Greek tomb in 1885, near Polistis-Chrysokon, two statuettes representing female dancers in the service of Aphrodite-Ariadne, one of which (fig. 182) bore six or more Swastikas. In other cases, says he (p. 678), the *Croix cantonnée* (the *Croix swasticale* of Zmigrodzki) replaced the Swastika on the garments, and he cites the statue of Hercules strangling the lion in the presence of Athena, whose robe is ornamented with the *Croix cantonnée*. He repeats that the two signs of the cross represent the idea of light, sun, sacrifice, rain, storm, and the seasons.

EUROPE.

BRONZE AGE.

Prehistoric archæologists claim that bronze was introduced into Europe in prehistoric times from the extreme Orient. The tin mines of the peninsula of Burma and Siam, with their extension into China on the north, Malacca and the islands of the archipelago on the south, are known to have been worked in extremely ancient times and are believed to have furnished the tin for the first making of bronze. The latter may not be susceptible of proof, but everything is consistent therewith. After it became known that copper and tin would make bronze, the discovery of tin would be greatly extended, and in the course of time the tin mines of Spain, Britain, and Germany might be opened. A hundred and more prehistoric bronze foundries have been discovered in western Europe and tens of thousands of prehistoric bronze implements. If bronze came originally from the extreme Orient, and the Swastika belonged there also, and as objects of bronze belonging to prehistoric times and showing connection with the Orient, like the tintinnabulum (fig. 29) have been found in the Swiss lake dwellings of prehistoric times, it is a fair inference that the Swastika

mark found on the same objects came also from the Orient. This inference is strengthened by the manufacture and continuous use of the Swastika on both bronze and pottery; until it practically covered, and is to be found over, all Europe wherever the culture of bronze prevailed. Nearly all varieties of the Swastika came into use during the Bronze Age. The objects on which it was placed may have been different in different localities, and so also another variety of form may have prevailed in a given locality; but, subject to these exceptions, the Swastika came into general use throughout the countries wherein the Bronze Age prevailed. As we have seen, on the hill of Hissarlik the Swastika is found principally on the spindle-whorl; in Greece and Cyprus, on the pottery vases; in Germany, on the ceintures of bronze; in Scandinavia, on weapons and on toilet and dress ornaments. In Scotland and Ireland it was mostly on sculptured stones, which are many times themselves ancient Celtic crosses. In England, France, and Etruria, the Swastika appears on small bronze ornaments, principally fibulæ. Different forms of the Swastika, i. e., those to the right, left, square, ogee, curved, spiral and meander, triskelion and tetraskelion, have been found on the same object, thereby showing their inter-relationship. No distinction is apparent between the arms bent to the right or to the left. This difference, noted by Prof. Max Müller, seems to fail altogether.

Greg says:¹

About 500 to 600 B. C., the fylfot, (Swastika) curiously enough begins to disappear as a favorite device of early Greek art, and is rarely, if ever, seen on the regular Etruscan vase.

This indicates that the period of the use of the Swastika during the Bronze Age in Europe lay back of the period of its disappearance in the time of early Greek art, and that it was of higher antiquity than would otherwise be suspected.

Dr. Max Ohnefalsch-Richter says:²

The Swastika makes absolute default in Cyprus during all the age of bronze and in all its separate divisions according as the vases were decorated with intaglio or relief, or were painted.

Etruria and Italy.—The Etruscans were a prehistoric people. The country was occupied during the two ages of stone, Paleolithic and Neolithic, and during the Bronze Age. The Etruscans were probably the descendants of the Bronze Age people. The longest continued geographical discussion the world has heard was as to *who were* the Etruscans, and *whence* or *by what* route did they come to their country? It was opened by Herodotus and Dionysius Halicarnassus in the fourth century B. C.; while Dr. Brinton and the late President Welling have made the latest contributions thereto. The culture of the Etruscans

¹Archæologia, XLVIII, pt. 2, p. 305.

²Bull. Soc. d'Anthrop., Paris, 1888, p. 679.

was somewhat similar to that of the Bronze Age peoples, and many of the implements had great resemblance, but with sufficient divergence to mark the difference between them. There were different stages of culture among the Etruscans, as can be easily and certainly determined from their tombs, modes of burial, pottery, etc.

The Swastika appears to have been employed in all these epochs or stages. It was undoubtedly used during the Bronze Age, and in Italy it continued throughout the Etruscan and into the Roman and Christian periods.

While it may be doubtful if any specimen of Swastika can be identified as having belonged to the Neolithic Age in Europe, there can be no doubt that it was in common use during the Bronze Age. Professor Goodyear gives it as his opinion, and in this he may be correct, that the earliest specimens of Swastika of which identification can be made are on the hut urns of central Italy. These have been considered as

belonging definitely to the Bronze Age in that country. Fig. 183 is a representation of one of these hut urns. It shows upon its roof several specimens of Swastika, as will be apparent from examination. There are other figures, incised and in relief. One of them is the celebrated "burning altar" mark of Dr. Schliemann. This specimen was found in the Via Appia near Rome, and is exhibited in the Vatican Museum. Similar specimens have been found in other parts of Etruria. The author saw in the Municipal Museum at Corneto many of them, which had been excavated from the neighboring cemetery of the prehistoric

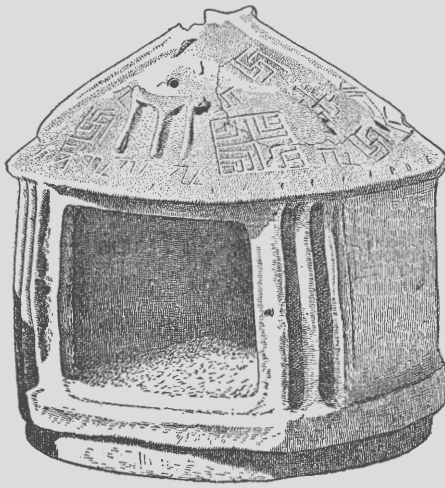


Fig. 183.

HUT URN IN THE VATICAN MUSEUM.

"Burning altar" mark associated with Swastikas.

Etruria (Bronze Age).

city of Corneto-Tarquini. They were of pottery, but made as if to represent rude huts of skin, stretched on cross poles, in general appearance not unlike the cane and rush conical cabins used to this day by the peasants around Rome. They belonged to the Bronze Age, and antedated the Etruscan civilization. This was demonstrated by the finds at Corneto-Tarquini. Tombs to the number of about 300, containing them, were found, mostly in 1880-81, at a lower level than, and were superseded by, the Etruscan tombs. They contained the weapons, tools, and ornaments peculiar to the Bronze Age—swords, hatchets, pins, fibulae, bronze and pottery vases, etc., the characteristics of which

were different from Etruscan objects of similar purpose, so they could be satisfactorily identified and segregated. The hut urns were receptacles for the ashes of the cremated dead, which, undisturbed, are to be seen in the museum. The vases forming part of this grave furniture bore the Swastika mark; three have two Swastikas, one three, one four, and another no less than eight.

Dennis figures a hut urn from Alba Longa,¹ and another from the Alban Mount.² He says (note 1):

These remarkable urns were first found in 1817 at Montecucco, near Marino, and at Monte Crescenzo, near the Lago de Castello, beneath a stratum of *peperino* (tufa) 18 inches thick. They were embedded in a yellowish volcanic ash and rested on a lower and earlier stratum of *peperino*.³

Curiously enough, the three or four pronged mark, called "burning altar" by Dr. Schliemann, is on both hut urns in Dennis's "Cities and Cemeteries of Etruria." Dr. Schliemann argues strongly in favor of the relationship between Swastika and the "burning altar" sign, but assigns no other reason than the similarity of the marks on the two objects. He appears unable, in "Ilios," to cite any instance of the Swastika being found on the hut urns in connection with the "burning altar" sign, but he mentions the Swastika five times repeated on one of the hut urns in the Etruscan collection in the museum of the Vatican at Rome.⁴ The photograph of the hut urn from the Vatican (fig. 183) supplies the missing link in Schliemann's evidence. The roof of the hut urn bears the "burning altar" mark (if it be a burning altar, as claimed), which is in high relief (as it is in the Dennis specimens), and was wrought in the clay by the molder when the hut was made. Such of the other portions of the roof as are in sight show sundry incised lines which, being deciphered, are found to be Swastikas or parts of them. The parallelogram in the front contains a cross and has the appearance of a labyrinth, but it is not. The other signs or marks, however, represent Swastikas, either in whole or in part. This specimen completes the proof cited by Schliemann, and associates the Swastika with the "burning altar" sign in the Etruscan country, as well as on the hill of Hissarlik and in other localities.

Dennis supposes the earliest Etruscan vases, called by many different names, to date from the twelfth century B. C. to 540 B. C.,⁵ the latter being the epoch of Theodoros of Samos, whose improvements marked an epoch in the culture of the country. He says:

These vases were adorned with annular bands, zigzag, waves, meanders, concentric circles, hatched lines, Swastikas, and other geometric patterns.

¹"Cities and Cemeteries of Etruria," I, p. 69.

²Ibid., II, p. 457.

³Annali dell' Instituto, Rome, 1871, pp. 239-279; Bulletino Instituto, Rome, 1871, pp. 34-52; Pigorini and Sir John Lubbock, "Notes on Hut Urns and other objects from Marino," London, 1869; Virchow, "Die Huttenurnen von Marino," Berlin, 1883.

⁴"Troja," p. 122.

⁵"Cities and Cemeteries of Etruria," I, p. lxxxix.

A fragment of Archaic Greek pottery is reported by Rochette from the necropolis of Cumæ, in the campagna of Italy, and is shown in fig.

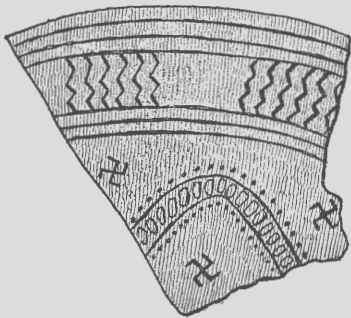


Fig. 184.

FRAGMENT OF ARCHAIC GREEK POTTERY WITH
THREE SWASTIKAS.

Cumæ, Italy.

Waring, "Ceramic Art in Remote Ages," pl. 42, fig. 1.

pattern was used many times and in many places without having any such meaning, and is no proof of his proposition.

Figs. 185 and 186 represent the one-handled cinerary urns peculiar to the Bronze Age in Italy. They are believed to have been contemporaneous with or immediately succeeding the

hut urns just shown. The cinerary urn shown in fig. 185 was found at Marino, near Albano, in the same locality and under the same condition as the hut urns.



Fig. 186.

CINERARY URN WITH SWASTIKAS
ENCLOSED BY INCISED LINES IN
INTAGLIO.

Cervetri, Italy.

"Comptable due Diecht in Bronze," pl. 5,
fig. 2,
1, natural size.

good example of Etruscan work is shown in the gold fibula (fig. 187). It is ornamented on the outside with the fine gold filigree work peculiar

184. Rochette reports it as an example of a very early period, believed by him to have been Phenician. When we consider the rarity of Phenician pottery in Italy compared with the great amount of Greek pottery found there, and that the Phenicians are not known to have employed the Swastika, this, combined with the difficulty of determining the place of origin of such a fragment, renders it more likely to have been Greek than Phenician. A reason apparently moving Rochette to this decision was the zigzag ornamentation, which he translated to be a Phenician sign for water; but this



Fig. 185.

CINERARY URN WITH SWASTIKAS IN PANELS.

San Marino, near Albano, Italy.

Vatican Museum.

The original is in the Vatican Museum and was figured by Pigorini in "Archæologia," 1869. Fig. 186 shows a one-handled urn of pottery with Swastika (left) in intaglio, placed in a band of incised squares around the body of the vessel below the shoulder. A small though

to the best Etruscan art. On the inside are two Swastikas. It is in the Vatican Museum of Etruscan antiquities. Fig. 188 represents another specimen of Etruscan gold filigree work with a circle and Swastika. It is a "bulla," an ornament said to indicate the rank of the wearer among the Etruscan people. It is decorated with a circle and Swastika inside. The figure is taken from "L'Art pour Tous," and is reproduced by Waring.

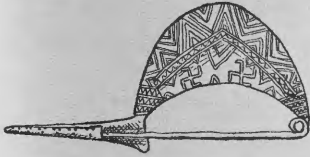


Fig. 187.

GOLD FIBULA WITH SWASTIKAS (LEFT).

Etruscan Museum, Vatican.

Catalogue of the Etruscan Museum, part 1, pl. 26, fig. 6.

 $\frac{1}{2}$ natural size.

from Cervetri (Cære), Etruria. It is furnished by Grifi, and reproduced by Waring. This specimen is to be remarked as having a small outward flourish from the extreme end of each arm, somewhat similar to that made by the Jains (fig. 33), or on the "Tablet of honor" of Chinese porcelain (fig. 31). Fig. 190 shows an Etruscan bronze fibula



Fig. 189.

ORNAMENTAL SWASTIKA ON
ETRUSCAN SILVER BOWL.

Cervetri (Cære), Etruria.

Waring, "Ceramic Art in Remote
Ages," pl. 41, fig. 13.

with two Swastikas and two Maltese crosses in the pin shield. It is in the Museum of Copenhagen, and is taken from the report of the Congrès Internationale d'Anthropologie et d'Archæologie Préhistorique, Copenhagen, 1875, page 486. This specimen, by its rays or crotchets around the junction of the pin with the shield, furnishes the basis of the argument by Goblet d'Alviella¹ that the Swastika was evolved from the circle and was a symbol of the sun or sun-god. (See p. 785.)

Bologna was the site of the Roman city Bononia, and is supposed to have been that of Etruscan Felsina. Its Etruscan cemetery is extensive. Different names have been given to the excavations, sometimes from the owner of the land and at other times from the names of excavators. The first cemetery opened was called Villanova. The culture was different from that of the other parts of Etruria. By some it is believed to be older, by others younger, than the rest of Etruria. The Swastika is found throughout the entire



Fig. 188.

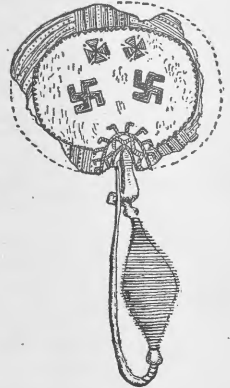
ETRUSCAN GOLD BULLA
WITH SWASTIKA ON
BOTTOM.Waring, "Ceramic Art in Remote
Ages," pl. 42, fig. 4a.

Fig. 190.

BRONZE FIBULA WITH TWO
SWASTIKAS AND SUPPOSED
RAYS OF SUN.²

Etruria.

Copenhagen Museum.

Goblet d'Alviella, fig. 19 a, De Mortillet,
"Musée Préhistorique," fig. 1263. $\frac{1}{2}$ natural size.¹ "La Migration des Symboles," p. 67.² See p. 786.

Villanova epoch. Fig. 191 shows a pottery vase from the excavation Arnoaldi. It is peculiar in shape and decoration, but is typical of that epoch. The decoration was by stamps in the clay (intaglio) of a given subject repeated in the narrow bands around the body of the vase. Two of these bands were of small Swastikas with the ends all turned to the right.

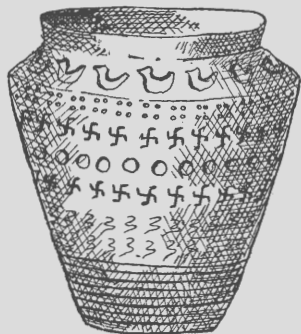


Fig. 191.

POTTERY URN ORNAMENTED WITH SUCCESSIVE BANDS IN INTAGLIO, TWO OF WHICH ARE COMPOSED OF SWASTIKAS.

Necropolis Arnoaldi, Bologna.

Museum of Bologna.

Gozzadini, "Scavi Archeologici," etc., pl. 4, fig. 8.

points consecutively placed, so as to give the appearance of a continuous line.

Swastikas turning both ways are on one or both extremities of many terra-cotta cylinders found in the terramare at Coazze, province of Verona, deposited in the National (Kircheriano) Museum at Rome. (See figs. 380 and 381 for similar bobbins.)



Fig. 193.

SWASTIKA SIGN ON CLAY BOBBIN.

Type Villanova, Bologna.

De Mortillet, "Musée Préhistorique," fig. 1259.

Fig. 192 shows a fragment of pottery from the Felsina necropolis, Bologna, ornamented with a row of Swastikas stamped into the clay in a manner peculiar to the locality.

Fig. 193 shows the end view of one of the bobbins from Bologna, Italy, in the possession of Count Gozzadini by whom it was collected. The decoration on the end, as shown by the figure, is the Swastika. The main arms are made up of three parallel lines, which intersect each other at right angles, and which all turn to the right at right angles. The lines are not incised, as is usual, but, like much of the decoration belonging to this culture, are made by little

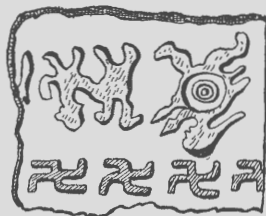


Fig. 192.

FRAGMENT OF POTTERY WITH ROW OF SWASTIKAS IN INTAGLIO.

Necropole Felsinea, Italy.

Museo Bologna.

Gozzadini, "Due Sepolcri," etc., p. 7.

$\frac{1}{2}$ natural size.

object is satisfactory evidence of their contemporaneous existence, and is thus far evidence that the one was not derived from the other, especially as the authorities who claim this derivation are at variance as to which was parent and which, child. (See fig. 133.)

A Swastika of the curious half-spiral form turned to the left, such

as has been found in Scandinavia and also among the Pueblo Indians of the United States, is in the museum at Este.

When in the early centuries of the Christian era the Huns made their irruption into Europe, they apparently possessed a knowledge of the Swastika. They settled in certain towns of northern Italy, drove off the inhabitants, and occupied the territory for themselves. On the death of Attila and the repulse of the Huns and their general return to their native country, many small tribes remained and gradually became assimilated with the population. They have remained in northern Italy under the title of Longobards. In this Longobardian civilization or barbarism, whichever we may call it, and in their style of architecture and ornament, the Swastika found a prominent place, and is spoken of as Longobardian.

It is needless to multiply citations of the Swastika in Roman and Christian times. It would appear as though the sign had descended from the Etruscans and Samnites along the

coast and had continued in use during Roman times. Schliemann says¹ that it is found frequently in the wall paintings at Pompeii; even more than a hundred times in a house in the recently excavated street of Vesuvius. It may have contested with the Latin cross for the honor of being the Christian cross, for we know that the St. Andrew's cross in connection with the Greek letter P (fig. 6) did so, and for a long time stood as the monogram of

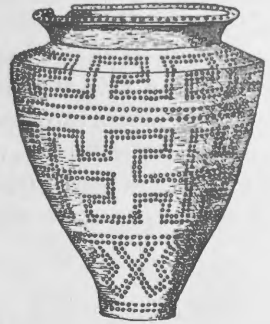


Fig. 194.

POTTERY VASE ORNAMENTED WITH BRONZE NAIL HEADS IN FORM OF SWASTIKA.

Este, Italy.

Matériaux pour l'Histoire Primitive et Naturelle de l'Homme, 1884, p. 14.

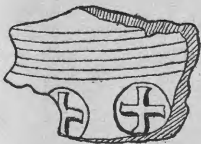


Fig. 195.

FRAGMENT OF POTTERY WITH SWASTIKA STAMPED IN RELIEF.

Christ and was the Labarum of Constantine. All three of these are on the base of the Archiepiscopal chair in the cathedral at Milan.²

Swiss lake dwellings.—Figs. 195 and 196 are interesting as giving an insight into the method of making the sign of the Swastika. Fig. 195 shows a fragment of pottery bearing a stamped intaglio Swastika (right), while fig. 196 represents the stamp, also in pottery, with which the imprint was made. They are figured by Keller,³ and are described on page 339, and by Chantre.⁴

They were found in the Swiss lake dwelling of Bourget (Savoy) by the Duc de Chaulnes, and are credited to his Museum of Chambéry.



Fig. 196.

STAMP FOR MAKING SWASTIKA SIGN ON POTTERY.

Swiss lake dwelling of Bourget, Savoy.

Musée de Chambéry.

Chantre, "Age du Bronze," figs. 53, 55, and Keller, "Lake Dwellings of Europe," pl. 161, fig. 8.

¹"Ilios," p. 352.

²There are bronze hatchets from Italy, with Swastikas in intaglio and in relief, in Musée St. Germain. De Mortillet, "Musée Préhistorique," figs. 1153, 1154.

³"Lake Dwellings," pl. 161, figs. 3, 4.

⁴"Age du Bronze," pt. 2, figs. 53-55, p. 195.

Germany and Austria.—Fig. 197 represents a fragment of a ceinture of thin bronze of the Halstattien epoch of the Bronze Age from a tumulus in Alsace. It is made after the style common to that period; the work is repoussé and the design is laid off by diagonal lines which divide the field into lozenges, wherein the Swastika is represented in various forms, some turned square to the right, others to the left, while one is in spiral and is turned

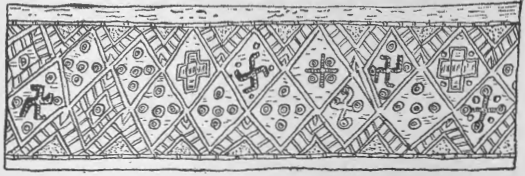


Fig. 197.

FRAGMENT OF CEINTURE FROM A TUMULUS IN ALSACE.
Thin bronze repoussé with Swastikas of various kinds.
Bronze Age, Halstattien epoch.
De Mortillet, "Musée Préhistorique," fig. 1255.

to the right, others to the left, while one is in spiral and is turned

to the left. Other forms of the cross also appear with dots in or about the corners, which Burnouf associates with the myth of Agni and fire making, and which Zmigrodzki calls the *Croix swasticale*. This specimen is in the collection Nessel at Haguenau. Another ceinture was found at the same place and is displayed with it.

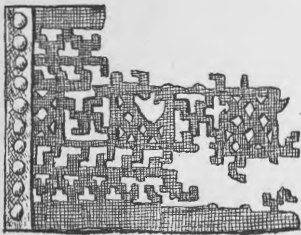


Fig. 198.

FRAGMENT OF A CEINTURE FROM THE TUMULUS OF METZSTETTEN, WÜRTEMBERG.
Thin bronze open work with intricate Swastikas.

Halstattien epoch.

De Mortillet, "Musée Préhistorique," fig. 1257, and Chantre, "Le Caucase," II, p. 50, fig. 25.

turned spirally to the left. Fig. 198 represents another fragment of a bronze ceinture from the same country and belonging to the same epoch.

It bears representations of the cross of different forms, one of which might be a Swastika with dotted cross lines, with the arms

turned spirally to the left. It is from the tumulus of Metzstetten, Würtemberg, and is in the Museum of Stuttgart. It is not repoussé, but is cut in open-work of intricate pattern in which the Swastika is the principal motif. A bronze fibula (fig. 199) is in the museum at Mayence, the body of which has the form of the normal Swastika. The arms are turned to the right and the lower one is broken off. The hinge for the pin was attached at one side or arm of the Swastika and the retaining clasp for the point at the other. Fig. 200 represents a prehistoric sepulchral urn



Fig. 199.

BRONZE FIBULA,
THE BODY OF
WHICH FORMS
A SWASTIKA.

Museum of Mayence.

De Mortillet, "Musée Préhistorique," fig. 1266.



Fig. 200.

SEPULCHRAL URN WITH SWASTIKA.

North Germany.

Waring, "Ceramic Art in Remote Ages," pl. 7, fig. 94.

with a large Swastika, the arms being indicated by three parallel lines, after the same manner as the Swastika on the clay bobbin from

Bologna (fig. 193). It is reported by Lisch and Schröter, though the locality is not given. It is figured by Waring. The form, appearance, and decoration are of the type Villanova, thus identifying it with northern Italy.

The Swastika sign is on one of the three pottery vases found on Bishops Island, near Königswalde, on the right bank of the Oder, and on a vase from Reichersdorf, near Guben;¹ on a vase in the county of Lipto, Hungary,² and on pottery from the Cavern of Barathegy, Hungary.³ Fig. 201 represents a spearhead of iron from Brandenburg, North Germany. It bears the mark of the Swastika with the ends turned to the left, all being at right angles, the ends ornamented with three dots recalling Zmigrodzki's *Croix swasticale* (figs. 12 and 13). By the side of this Swastika is a triskelion, or three-armed ogee sign, with its ends also decorated with the same three dots.

What relation there is between all these marks or signs and others similar to them, but separated by great distances of both time and space, it would be mere speculation to divine.

M. E. Chantre reports his investigations in certain Halstattien cemeteries in Italy and Austria.⁴ At San Margarethen, on the road between Rudolfswerth and Kronau, Bavaria, he encountered a group of tumuli. Many objects of the "bel age du bronze"

were found; among others, a bronze pin (fig. 202) with a short stem, but large, square, flat head, was

found, with a normal Swastika engraved with small dots, pointillé, such as has been seen in Italy, Austria, and Armenia.

Belgium.—The Museum of Namur, Belgium, possesses a small object of bone, both points of which have

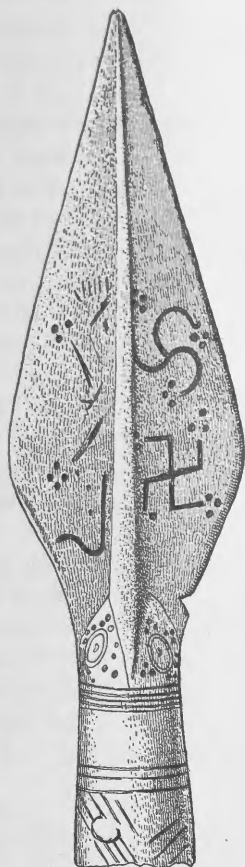


Fig. 201.

SPEARHEAD WITH SWASTIKA (CROIX SWASTICALE) AND TRISKELION.

Brandenburg, Germany.

Waring, "Ceramic Art in Remote Ages," pl. 44, fig. 21, and "Viking Age," 1, fig. 336.

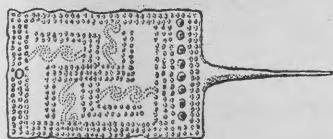


Fig. 202.

BRONZE PIN WITH SWASTIKA, POINTILLÉ, FROM MOUND IN BAVARIA.

Chantre, *Matériaux pour l'Histoire Primitive et Naturelle de l'Homme*, 1884, pp. 14, 120.

¹ *Zeitschrift für Ethnographie*, Berlin, 1871 and 1876.

² Coll. Majlath Bela; Hampel, "Antiquités Préhistoriques de la Hongrie;" *Erztergom*, 1877, pl. 20, No. 3.

³ Hampel, "Catalogue de l'Exposition des Musées des Provinces," Budapest, 1876, p. 17; Schliemann, "Ilios," p. 352.

⁴ *Matériaux pour l'Histoire Primitive et Naturelle de l'Homme*, 1884, pp. 14, 120.

been broken; its use is somewhat indeterminable, but it is believed by the curator of that museum and others to have been an arrowhead or spearhead. In form it belongs to Class A of stemmed implements, is lozenge-shaped, without shoulder or barb. It is a little more than two inches long, five-eighths of an inch wide, is flat and thin. On one side it bears two oblique or St. Andrew's crosses scratched in the bone; on the other, a figure resembling the Swastika. It is not the normal Swastika, but a variation therefrom. It is a cross about three-eighths of an inch square. The main stem lines cross each other at right angles; the ends of each of these arms are joined by two incised lines, which gives it the appearance of two turns to the right, but the junction is not well made, for the lines of the cross extend in every case slightly farther than the bent end. The variation from the normal Swastika consists of the variation produced by this second line. This object was lately found by M. Dupont, of Brussels, in the prehistoric cavern of Sinsin, near Namur. Most, or many, of these caverns belong to Paleolithic times, and one, the Grotte de Spy, has furnished the most celebrated specimens of the skeletons of Paleolithic man. But the cavern of Sinsin was determined, from the objects found therein, to belong to the Bronze Age.

Scandinavia.—The evidences of prehistoric culture have great resemblance throughout Denmark, Sweden, and Norway; so it is believed that during the prehistoric ages their peoples had the same culture, and the countries have been classed together as Scandinavia.

A bronze sword is reported by Mr. George Stephens¹ as having been found at Sæbo, Norway, with runes and a Swastika inlaid with silver. This specimen (fig. 203) was the subject of discussion before the Inter-

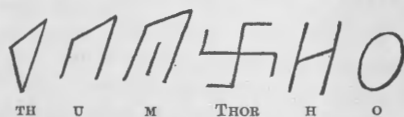


Fig. 203.

RUNIC INSCRIPTION CONTAINING A SWASTIKA.

Inlaid with silver on a bronze sword.

Sæbo, Norway.

national Congress of Anthropology and Prehistoric Archæology,² at Budapest, 1876. Its runes were translated by Stephens, and being read from right to left, "OH THURMUTH," or "owns me Thurmuth." But on the same page he gives another sign for Thu and renders 卐 as Odin or (W)oden. In the discussion before the congress it seems to have been agreed that the sign 卐 stood for "blessing," "good luck," or some beneficent charm or benediction. A spearhead has been for

¹ "Old Northern Runic Monuments," pt. 3, p. 407.

² Proceedings of the Eighth Session, 1, pp. 457-460.

years displayed in the museum at Torcello, near Venice, Italy, with a Swastika sign (fig. 204a) prominent as an engraved sign.¹ Associated with it, but not a part of it, was an inscription (fig. 204b), which has always been attributed to the Etruscans. Mr. I. Undset, an archæologist in the museum of Christiania, made an extended visit through Italy in 1883, and on seeing this spearhead

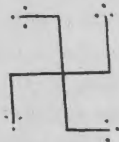


Fig. 204a.
SWASTIKA WITH DOTS.
Torcello, Italy.

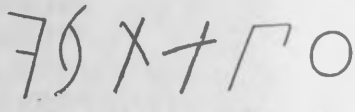


Fig. 204b.
RUNIC INSCRIPTION ON SPEARHEAD.
Torcello, Italy.
Du Chaillu, "Viking Age," I, fig. 335.

recognized the inscription as runic and belonging to Scandinavia. The arms of the Swastika turned to the left, and the ends were finished with three dots of the same style as those described employed in the *Croix swasticale* (fig. 12). Figs. 205 and 206 represent articles of dress or toilet, and bear the Swastika. The first shows a redding comb, the Swastika on which turns to the right. It was probably of bone or horn, as are those of modern times. Fig. 206 shows a brooch, the interior decoration of which is a combination of Swastikas more or less interlaced. It is of bronze and was used as a dress ornament. Fig. 207 shows a large brooch, the bodies and bar of which are almost covered with the tetraskelion style of Swastika. There are six of the four-armed Swastikas, four of which turn to the left and two to the right. Another is a triskelion, the arms of which turn to the right.

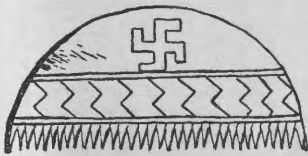


Fig. 205.
REDDING COMB WITH SWASTIKA.
Scandinavia.

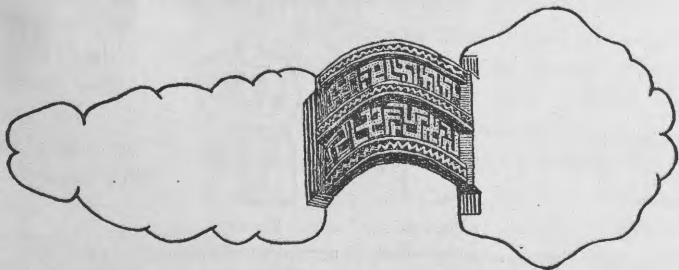


Fig. 206.
BRONZE BROOCH OR FIBULA WITH COMBINATION OF SWASTIKAS.
Scandinavia.

In Scandinavia more than in other countries the Swastika took the form of a rectangular body with arms projecting from each corner and bending in a spiral form, sometimes to the right, sometimes to the left.

¹ Du Chaillu, "Viking Age," I, fig. 335.

These are found more frequently on fibulæ or brooches and on swords and scabbards. In fig. 208 is shown a placque for a ceinture or belt, with a buckle to receive the thong. It contains two ogee Swastikas (tetraskelions). In this and



Fig. 207.

BRONZE BROOCH WITH SWASTIKAS.

Tetraskelions (right and left),
triskelion (left).
Scandinavia..

fig. 207 the border and accessory decoration consist largely of ogee curves, which, here represented separate, would, if placed together as a cross, form the same style of Swastika as those mentioned. Figs. 209 and 210 show sword scabbards, with Swastikas turned both ways. Fig. 211 shows two triskelions. Fig. 212 represents a gold brooch from a grave at Fyen, reported by Worsaae and figured by Waring.¹ The brooch with ogee Swastika bears internal evidence of Scandinavian workmanship. There are other Swastikas of the same general form and style in distant localities, and this specimen serves to emphasize the extent of possible communication between distant peoples in prehistoric times.

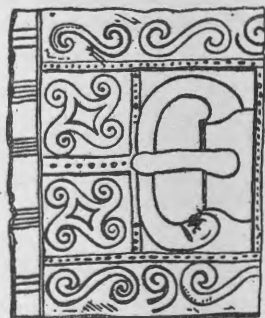


Fig. 208.

PLAQUE FOR CEINTURE, WITH BUCKLE.

Two ogee Swastikas (tetraskelions).

Fig. 213 represents a piece of horse-gear of bronze, silver plated and ornamented with Swastikas. Two of these are normal, the ends bent at right angles to the left, while the other is fancifully made, the only specimen yet found

of that pattern.²

It is not seen that these fanciful additions serve any purpose other than decoration. They do not appear to have changed the symbolic meaning of the Swastika.

Fig. 214 represents



Fig. 209.

SCANDINAVIAN SWORD SCABBARD.

Two ogee Swastikas (tetraskelions), right and left.



Fig. 210.

SCANDINAVIAN SWORD SCABBARD.

Ogee Swastika.



Fig. 211.

SCANDINAVIAN SWORD SCABBARD.

Two triskelions, right and left.

a sword scabbard belonging to the Vimose find, with a normal Swastika. Ludwig Müller reproduces a Swastika cross from a runic stone

¹ "Ceramic Art in Remote Ages," pl. 43, fig. 11; "Viking Age," II, fig. 1311; Englehardt, "L' Ancien Age de Fer," fig. 28.

² Du Chailu, "Viking Age," I, fig. 379.

in Sweden. In an ancient church in Denmark, the baptismal font is decorated with Swastikas, showing its use in early Christian times. (See p. 878 for continuation of Swastika on Scandinavian or Danish gold bracteates.)

Mr. Paul du Chaillu, in his "Viking Age," mentions many specimens of Scandinavian and Norse antiquities bearing Swastika marks of divers styles: Bronze vessels (vol. 1, p. 100, note 1); iron spear point with runes and Swastika inlaid with silver, discovered in a tumulus with burnt bones, Muncheburg, fig. 336; another of the same, Volhynia, Russia, fig. 337; pottery vessel containing burnt bones, pointed iron knife, bronze needle, and melted glass beads, Bornholm, fig. 210; iron spearhead, Vimose bog find, (p. 207); border of finely woven silk cloth with gold and silver threads, from a mound (vol. 2, p. 289, fig. 1150).

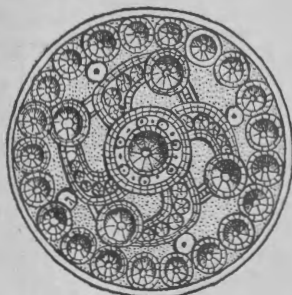


Fig. 212.

GOLD BROOCH WITH OGEE SWASTIKA.

Island of Fyen.

Waring, "Ceramic Art in Remote Ages," pl. 43, fig. 11.

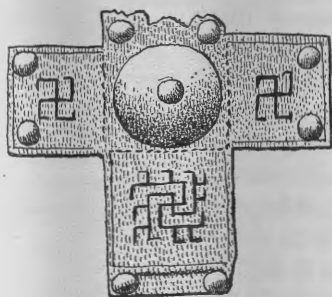


Fig. 213.

SCANDINAVIAN HORSE-GEAR.

Silver plated on bronze.

Waring, "Ceramic Art in Remote Ages," pl. 44, fig. 16;
Du Chaillu, "Viking Age," i, fig. 379.

bearing upon this question. They are somewhat obliterated and their reading difficult. So far as made out, they are as follows: Maqimaqa and Apiloggo.

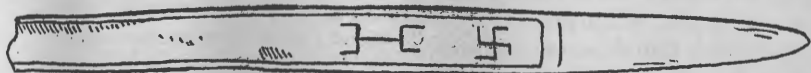


Fig. 214.

SCANDINAVIAN SWORD SCABBARD WITH NORMAL SWASTIKA.

Vimose bog find.

In Scotland, the Newton stone, in the grounds of the Newton House, bears an Ogam inscription, the meaning of which has no bearing upon

the subject. But on the upper part of one of its faces appears an inscription, boldly and deeply incised, of forty-four characters arranged horizontally in six lines. These are of so remarkable a type as to have

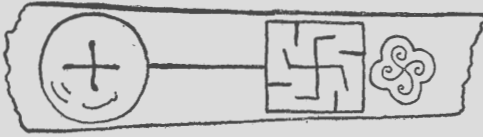


Fig. 215.

SCULPTURED STONE.

Greek cross in circle, normal Swastika in square, and ogee Swastika in quatrefoil.

Ireland.

ment of it. Various readings have been given by the learned gentlemen, who have reported it to be Hebrew, Phenician, Greek, Latin, Aryan, Irish, and Anglo-Saxon respectively. Brash¹ gives his opinion that the inscription is in debased Roman letters of a type frequently found in ancient inscriptions, its peculiarities being much influenced by the hardness of the stone at the time of cutting and of the subsequent weather wear of ages.

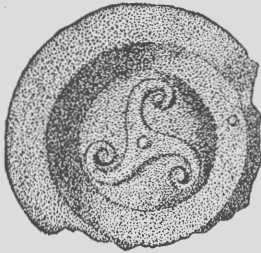


Fig. 217.

FRAGMENT OF THIN BRONZE.

Triskelion.

Ireland.

Munro, "Lake Dwellings of Europe," p. 384, pl. 124, figs. 20-22.

The interest of this monument to us is that the third character in the fourth line is a Swastika. It is indifferently made, the lines do not cross at right angles, two of the ends are curved, and the two others bent at a wider than right angle. There are four characters in the line closely following each other. (See p. 797.)



Fig. 216.

FRAGMENT OF THIN BRONZE REPOUSSÉ.

Ogee Swastika.

Ireland.

Munro, "Lake Dwellings of Europe," pl. 124, figs. 20-22.

land, bearing Ogam characters, contains a figure or mark reported by George M. Atkinson as a Swastika.²

On the Celtic crosses of Scotland certain marks appear which are elsewhere found associated with Swastika,

and consequently have some relation therewith. The "Annam Stone" bears the mark of a Swastika (left) within three concentric circles, around the outside of which is a circle of dots.³



Fig. 218.

BRONZE PIN WITH SMALL NORMAL SWASTIKA ON HEAD.

Crannog of Lochlee, Tarbolton, Scotland.

Munro, "Lake Dwellings of Europe," p. 417.

¹"Ogam Inscribed Monuments," p. 359, pl. xlix.

²Ibid., p. 358, pl. xlvi.

³Greg, *Archæologia*, XLVIII, pt. 2, pl. 19, fig. 27.

Ludwig Müller reports the Swastika in Scotland and Ireland on Christian tombs, associated with Latin crosses.¹

A sculptured stone in Ireland (fig. 215) shows on the face three varieties of the cross, a Greek cross in a circle, a Swastika with square ends turned to the right, within a rectangle, and an ogee (tetraskelion) turned to the right, inclosed in a quatrefoil.²


An Irish bowl showed a Swastika thus . Dr. R. Munro³ reports from the Crannog of Lesnacroghera country, Antrim, Ireland, two pieces or disks of thin bronze, repoussés (fig. 216), bearing the sign of the Swastika and having the four arms of the spirals turned to the left. The similarity of this figure with those shown on the shields of the Pima Indians of New Mexico and Ari-



Fig. 219.

CARVED TRISKELION FOUND ON FRAGMENT OF ASH WOOD.

Crannog of Lochlee, Tarbolton, Scotland.

Munro, "Lake Dwellings of Europe," p. 415.

zona (figs. 257 and 258) is to be remarked. Fig. 217

shows a triskelion of symmetric spirals turned to the right. In the Crannog of Lochlee, near Tarbolton, a bronze pin was found (fig. 218), the head of which was inclosed in a ring. On one side of the head was engraved a Greek cross, on the other was a normal Swastika turned to the right. The same crannog furnished a piece of ash wood five inches square, which had been preserved, as were all the other objects, by the peat, on which was carved a triskelion (fig. 219) after the form and style of those on the Missouri mound pottery.

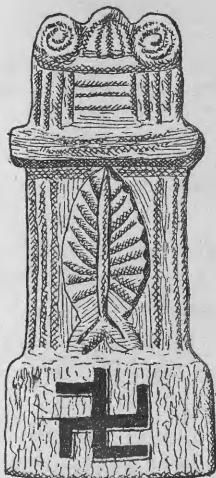


Fig. 220.

STONE ALTAR WITH SWASTIKA ON PEDESTAL.

France.

Museum of Toulouse.

De Mortillet, "Musée Préhistorique," fig. 1567.

GALLO-ROMAN PERIOD.

France.—The employment of the Swastika in France did not cease with the Bronze or Iron ages, but continued into the occupation of Gaul by the Romans.

Fig. 220 represents a stone altar erected in the south of France among the Pyrenees about the time of the advent of the Romans. It has a Swastika engraved on its pedestal. The upper arm has been carried beyond the body of the sign, whether by intention is not

¹ "La Migration des Symboles," p. 49.

² Zmigrodzki "Zur Geschichte der Swastika," taf. 6, fig. 248.

³ "Lake Dwellings of Europe," p. 384, pl. 124, figs. 20-22.

apparent. Fig. 221 represents a pottery bottle with another specimen of Swastika belonging to the same (Gallo-Roman) epoch, but coming from the extreme north of Gaul, the neighborhood of Rouen. It is to be remarked that the ends of this Swastika give the outward curve or flourish similar to that noticed by Dr. Schlie-mann on the spindle-whorl of Troy, and is yet employed in making the Jain Swastika (fig. 33).

M. Alexander Bertrand¹ speaks of the discovery at Velaux, in the department of Bouches-du-Rhône, of the headless statue of a crouching or squatting guard which has a row of Swastikas across his breast, while beneath is a range of crosses, Greek or Latin. The newest examples of the Swastika belonging to this epoch have been found at Estinnes, Hainaut, and at Anthée, Namur, Belgium, on pieces of Roman tile; also on a tombstone in the Roman or Belgo-Roman cemetery of Jusleville near Pepinster.² This is a Pagan tomb, as evidenced by the inscriptions commenced "D. M." (*Diis Manibus*).³



Fig. 221.

POTTERY BOTTLE OF DARK GRAY WITH SWASTIKA AND DECORATION IN WHITE BARBOTINE.

Gallo-Roman Epoch.
Museum of Rouen.

De Mortillet, "Musée Préhistorique," fig. 1246.

ANGLO-SAXON PERIOD.

Britain.—Greg reports⁴ a silver disk $1\frac{1}{2}$ inches in diameter, with a triskelion made by punched dots, in the same style as the pin heads from Armenia (figs. 35 and 36).


This was from grave 95 in an Anglo-Saxon cemetery at Sleafors, England, excavated by George W. Thomas and sold at Boston; bought by A. W. Franks and given to the British Museum. Grave 143 had a large cruciform fibula of bronze, partly gilt, similar to those from Scandinavia, with a Swastika on the central ornament thus . The slight curve or flourish on the outer end of the bent arm of this specimen resembles the Jain Swastika (fig. 33), though this bends to the left, while the Jain Swastikas bend to the right. Fig. 222 shows an Anglo-Saxon bronze gilt fibula with a peculiar form of Swastika leaving a square with dot and circle in its center. It was found in Long Wittenham, Berkshire, was reported in *Archæologia*,⁵ and is figured



Fig. 222.

ANGLO-SAXON BRONZE GILT FIBULA.⁵

Simulation of Swastika.
Long Wittenham, Berkshire, England.

Wittenham, Berkshire, was reported in *Archæologia*,⁵ and is figured

¹ "L'Autel de Saintes et les triades gauloises," *Revue Archéol.*, 1880, xxxix, p. 343.

² *Institut Archéologique Liégeois*, x, 1870, p. 106, pl. 13.

³ "La Migration des Symboles," p. 47, fig. 13.

⁴ *Archæologia*, l, pt. 2, p. 406, pl. 23, fig. 7.

⁵ See fig. 238.

⁶ *Archæologia*, xxxi.

by Waring.¹ A figure having great similarity to this, even in its peculiarities and called a Swastika, was found on a shell in Toco Mound, Tennessee (fig. 238). Fig. 223 represents an Anglo-Saxon urn from Shropham, Norfolk. Its decorations consist of isolated figures like crosses, etc., arranged in horizontal bands around the vessel, and separated by moldings. The lower row consists of Swastikas of small size stamped into the clay and arranged in isolated squares. There are twenty Swastikas in the band; though they all turn to the right, they are not repetitions. They were made by hand and not with the stamp. They are white on a blackish ground. The original, which is in the British Museum, is cited by Kemble and figured by Waring.²

THE SWASTIKA ON ANCIENT COINS.

There has been much ink and imagination used, most of which has been wasted, in the discussion of this branch of this subject. The opinion has been expressed by many persons that the triskelion which formed the armorial emblem of the island of Sicily, and also of the Isle of Man, is but an evolution



Fig. 223.

POTTERY URN.

Band of twenty hand-made Swastikas white, on blackish ground.

Shropham, Norfolk, England.

British Museum.

Waring, "Ceramic Art in Remote Ages," pl. 3, fig. 50.



Fig. 224.³

LYCIAN COIN.

Triskelion with three arms representing cocks' heads and necks.

and also of the Isle of Man, is but an evolution from or modification of the Swastika. In the judgment of the author this is based rather upon the similarity of the designs than upon any likeness in their origin and history. The acceptance by modern writers of this theory as a fact is only justified from its long-continued repetition.

Triskelion, Lycia.—The triskelion on ancient coins first appears on the coins of Lycia, in Asia Minor, about B. C. 480. It was adopted for Sicily by Agathocles, B. C. 317 to 307. The coins of Lycia were first three cocks' heads and necks joined together equidistant in the center of the field, as shown in fig. 224, while figs. 225 and 226 bear a center dot and circle. This forms a hub and axle. Out of this hub spring three arms or rays, practically equidistant, the outer ends being bent to the left. They increase in size as they progress



Figs. 225 and 226.³

LYCIAN COINS.

Triskelions with central dots and circles.

Waring, "Ceramic Art in Remote Ages," pl. 42, figs. 12, 13.

¹ "Ceramic Art in Remote Ages," pl. 43, fig. 10.

² Ibid., pl. 3, fig. 50.

³ See p. 787.

outward and are largest at the outer ends. In fig. 226 there is a mint mark or counter mark of the same design as the triskelion, except that it has but two arms or rays (diskelion).


Perrot and Chipiez,¹ speaking of Lycia, say:

The device of many of her coins is the "triskelis" or so-called "triquetra" (literally, three-cornered, triangular), a name derived from three serpents' heads, which usually figure in the field, much after the fashion of those supporting the famous tripod at Delphi,² consecrated by the Greeks to Apollo after the battle of Plataea. The number of heads is not constant, some coins having as many as four, "tetras-kelis," while others have but two, "diskelis."³

The Greeks connected the symbol with the cult of Apollo, which they represented as very popular and of hoary antiquity in Lycia. The three-rayed design appears to have gained the victory over the others, and came into commoner use. It is found on Assyrian coins, and also as a countermark on coins of Alexander, B. C. 333 to 323. A comparison of these designs with the Swastika will, it is believed, show their dissimilarity, and the non-existence of relationship. In the Lycian designs, whether with two, three, or four rays, there is a central hub out of which the spokes spring. In the center of the hub is the small circle and dot which might represent the axle on which the machine revolved. In fact, the Lycian design is a fair representation of the modern screw propeller, and gives the idea of a whirling motion.

Compare these peculiarities with the Swastika. The Swastika is almost always square, is always a cross at right angles or near it, and whatever may become of the ends or arms of the cross, whether they be left straight, bent at right angles, or in a curve, it still gives the idea of a cross. There is no center except such as is made by the crossing of the two arms. There is not, as in these triskelions, a central hub. There is no dot or point around which the design or machine could be made to revolve, as in these Lycian triskelions; nothing of the central boss, cup, or nave, which forms what the Germans call the "Rad-Kreuz," wheel cross, as distinguished from the square cross.

In this regard Greg says:

If R. Brown's lunar and Semitic or Asiatic origin of the triquetra, however, should be established, then the entire argument of the triquetra being derived from the fylfot, or vice versa, falls to the ground. * * * That the device arose out of the triskele and triquetra I do not think can be proved. It is clear the  was a far older and more widely spread symbol than the triskele, as well as a more purely Aryan one.

Waring, explaining the tetraskelion (four-armed), declares it to have preceded the triskelion (three-armed), and he explains its meaning,⁴ citing Sir Charles Fellows, as being a harpago, a grappling iron, a canting sign for Harpagus, who conquered Lycia for Cyrus, circa, 564 B. C.

¹ "History of Art in Phrygia, Lydia, Caria, and Lycia," p. 391.

² An unique cast of this tripod is in the U. S. National Museum, Department of Oriental Antiquities.

³ The number of heads may have been regulated by the size of the coins in question, probably answering to different values.

⁴ "Ceramic Art in Remote Ages," p. 85.

This, with the statement of Perrot and Chipiez (p. 872 of this paper), is a step in explanation of the adoption of the triskelion, and together they suggest strongly that it had no relation to the Swastika. At the date of the appearance of the triskelion on the Lycian coins the Swastika was well known throughout the Trojan peninsula and the Aegean Sea, and the difference between them was so well recognized that one could not possibly have been mistaken for the other.

Triskelion, Sicily.—Now we pass to the consideration of the triskelion of Sicily. Fig. 227 represents a coin of Sicily. On the obverse the head of Persephone, on the reverse the quadriga, and above, the triskelion.

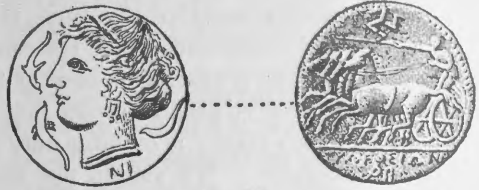


Fig. 227.

SICILIAN COIN WITH QUADRIGA AND TRISKELION.
British Museum.

Barclay Head, "Coins of the Ancients," etc., pl. 35, fig. 28.

Other specimens of the same kind, bearing the same triskelion, are seen in Barclay Head's work on the "Coinage of Syracuse" and his "Guide to the Ancient Coins in the British Museum." They belong to the early part of the reign of Agathocles, B. C. 317 to 310. In these specimens the triskelion is quite small; but as the coins belong to the period of the finest engraving and die-sinking of Greece, the representation, however minute, is capable of decipherment.

Fig. 228 is taken from the shield of a warrior on a Greek vase representing Achilles and Hector, in which the armorial emblem of Sicily, the triskelion, occupies the entire field,¹ and represents plainly that it is three human legs, conjoined at the thigh, bent sharply at the knee, with the foot and toes turned out. Some of these have been represented covered with mail armor and the foot and leg booted and spurred. It is evident that these are human legs, and so were not taken from the screw propeller of Lycia, while they have no possible relation to the crossed arms of the Swastika, and all this despite their similarity of appearance. This is rendered clearer by Waring,² where the armorial emblem on a

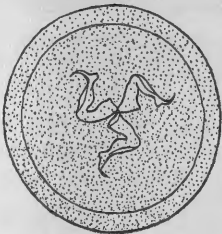


Fig. 228.

WARRIOR'S SHIELD.

From a Greek vase, representing Achilles and Hector.

Agrigentum, Sicily.

Waring, "Ceramic Art in Remote Ages," pl. 42, fig. 24.

warrior's shield is a single human leg, bent in the same manner, instead of three. Apropos of Swastikas on warriors' shields, reference is made to figs. 257 and 258, which represent two shields of Pima Indians, New Mexico, both of which have been in battle and both have the four-armed Swastika or tetraskelion. There is not in the Swastika, nor was there ever, any central part, any hub, any axis, any revolution. It is asserted that originally the triskelion of Sicily, pos-

¹ "Ceramic Art in Remote Ages," pl. 13, fig. 24.

Ibid., pl. 13, fig. 21.

sibly of Lycia, was a symbol of the sun, morning, midday, and afternoon, respectively. But this was purely theoretical and without other foundation than the imagination of man, and it accordingly gave way in due course. Pliny denies this theory and attributes the origin of the triskelion of Sicily to the triangular form of the island, ancient Trinacria, which consisted of three large capes equidistant from each other, pointing in their respective directions, the names of which were Pelorus, Pachynus, and Lilybæum. This statement, dating to so early a period, accounting for the triskelion emblem of Sicily, is much more reasonable and ought to receive greater credit than that of its devolution from the Swastika, which theory is of later date and has none of these corroborations in its favor. We should not forget in this argument that the Swastika in its normal form had been for a long time known in Greece and in the islands and countries about Sicily.

Among hundreds of patterns of the Swastika belonging to both hemispheres and to all ages, none of them have sought to represent anything else than just what they appear to be, plain marks or lines. There is no likeness between the plain lines of the Swastika and the bent form of the human leg, with the foot turned outward, incased in chain armor and armed with spurs.

Whenever or however the triskelion occurred, by whom it was invented, what it represented, how it comes to have been perpetuated, is all lost in antiquity and may never be known; but there does not seem to be any reason for believing it to have been an evolution from the Swastika.

Triskelion, Isle of Man.—The triskelion of Sicily is also the armorial emblem of the Isle of Man, and the same contention has been made for it, i. e., that it was a modification of the Swastika. But its migration direct from Sicily to the Isle of Man can be traced through the pages of history, and Mr. John Newton,¹ citing the Manx Note Book for January, 1886, has given this history at length, of which the following is a résumé:

Prior to the thirteenth century the Isle of Man was under dominion of the Norse Vikings, and its armorial emblems were theirs; usually a ship under full sail. Two charters of Harold, King of Man (1245, 1246 in the Cotton MSS.), bear seals with this device. Twenty years later, after the conquest of the island by, and its cession to, Alexander III of Scotland, A. D. 1266, the Norse emblems disappeared entirely, and are replaced by the symbol of the three legs covered with chain armor and without spurs. "It appears then," says Newton, "almost certain, though we possess no literary document recording the fact, that to Alexander III of Scotland is due the introduction of the 'Tre Cassyn' as the distinguishing arms of the Isle of Man." He then explains how this probably came about: Frederick II (A. D. 1197-1250), the Norman King of Sicily, married Isabella, the daughter of Henry III of England.

¹ Athenæum, No. 3385, September 10, 1892, p. 353.

A quarrel between the King of Sicily and the Pope led the latter to offer the crown to Henry III of England, who accepted it for his son Edmund (the Hunchback), who thereupon took the title of King of Sicily and quartered the Sicilian arms with the Royal arms of England. The negotiations between Henry and the Pope progressed for several years (1255 to 1259), when Henry, finding that he could no longer make it an excuse for raising money, allowed it to pass into the limbo of forgotten objects.

Alexander III of Scotland had married Margaret, the youngest daughter of Henry III, and thus was brother-in-law to Edmund as well as to Frederick. In 1256, and while these negotiations between Henry and the Pope concerning Sicily were in progress, Alexander visited, at London, his royal father-in-law, the King of England, and his royal brother-in-law, the King of Sicily, and was received with great honors. About that time Haco, the Norse king of the Isle of Man, was defeated by Alexander III of Scotland, and killed, soon after which event (1266) the Isle of Man was ceded to the latter. The Norse coat of arms disappeared from the escutcheon of the Isle of Man, and, being replaced by the three legs of Sicily, Mr. Newton inquires:

What more likely than that the King (Alexander III), when he struck the Norwegian flag, should replace it by one bearing the picturesque and striking device of Sicily, an island having so many points of resemblance with that of Man, and over which his sister ruled as Queen and her brother had been appointed as King?

However little we may know concerning the method of transfer of the coat of arms from Sicily to the Isle of Man, we are not left at all in doubt as to the fact of its accomplishment; and the triskelion of Sicily became then and has been ever since, and is now, the armorial emblem of the Isle of Man.

The Duke of Athol, the last proprietary of the Isle of Man, and who, in 1765, sold his rights to the Crown of England, still bears the arms of Man as the fifth quartering, "The three human legs in armor, conjoined at the upper part of the thigh and flexed in triangle, proper garnished," being a perpetuation of the triskelion or triquetrum of Sicily.¹

The arms of the Isle of Man afford an excellent illustration of the migration of symbols as maintained in the work of Count Goblet d'Alviella; but the attempt made by others to show it to be an evolution from and migration of the Swastika is a failure.

Punch marks on Corinthian coins mistaken for Swastikas.—But is the Swastika really found on ancient coins? The use of precious metals as money dates to an unknown time in antiquity. Gold was used in early Bible times (1500 B. C.) among nearly every people as money, but it was by weight as a talent, and not as minted coin. The coinage of money began about 700 B. C. in Lydia. Lydia was a province on the western side of the peninsula of Asia Minor looking out toward Greece,

¹Debrett's "Complete Peerage of the United Kingdom of Great Britain and Ireland."

while Lycia, its neighbor, was a province on the southern side looking toward the island of Rhodes. The Lydians began coinage by stamping with a punch each ingot or nugget of gold or silver, or a mixture of them called "Electrum." In the beginning these ingots were marked upon but one side, the reverse showing plainly the fiber of the anvil on which the ingot was laid when struck with the punch. But in a short time, it may have been two hundred years, this system was changed so as to use a die which would be reproduced on the coin when it was struck with a punch. The lion, bull, boar, dolphin, and many other figures were employed as designs for these dies. Athens used an owl; Corinth, Pegasus; Metapontine, a sheaf of wheat; Naples, a human-headed bull. The head and, occasionally, the entire form of the gods were employed. During almost the entire first period of nigh three hundred years the punch was used, and the punch marks show on the reverse side of the coins. These punch marks were as various as the dies for the obverse of the coins, but most of them took a variety of the square, as it would present the greatest surface of

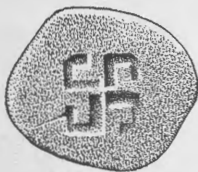


Fig. 229.

CORINTHIAN COINS.

Obverse and reverse.

Punch mark resembling Swastika.

resistance to the punch. Even the triskelion of the Lycian coins is within an indented square (figs. 225 and 226). A series of these punch marks is given for demonstration on pl. 9. A favorite design was a square punch with a cross of two arms passing through the center, dividing the field into four quarters. Most of the punch marks on the coins of that period were of this kind. These punch marks and the method and machinery with which they were made are described in standard numismatic works.¹

It is believed by the author that the assertions as to the presence of the Swastika on these ancient coins is based upon an erroneous interpretation of these punch marks. Fig. 229 shows the obverse and reverse of a coin from Corinth. It belonged to the first half of the sixth century B. C. The obverse represents a Pegasus standing, while the reverse is a punch mark, said to have been a Swastika; but, examining closely, we will find there is no Swastika in this punch mark. The arms of the normal Swastika consist of straight lines crossing each other. In this case they do not cross. The design consists of four gammas, and each gamma is separated from its fellows, all forming together very nearly the same design as hundreds of other punch marks of the same period. If each outer arm of this mark is made slightly longer, the Swastika form disappears and the entire design resolves

¹ Snowden, "Mint Manual of Coins of all Nations," Introduction, pp. ix-xiv; Ackerman, "Roman Coins," pl. 14.

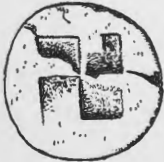
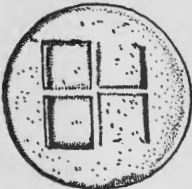
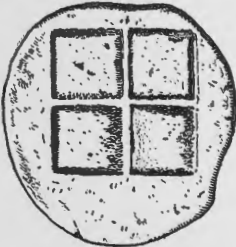
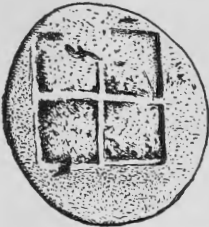
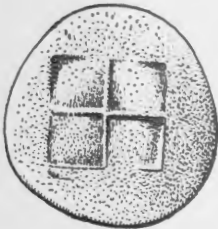
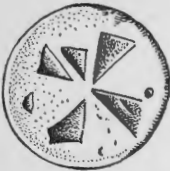
EXPLANATION OF PLATE 9.

1	2	3
4	5	6
7	8	9
10	11	12

PUNCH MARKS ON REVERSE OF ANCIENT COINS.

- Fig. 1. COIN OF LYDIA. Electrum. Oblong sinking between two squares. Babylonian stater. The earliest known coinage. Circa 700 B. C.
2. PHENICIAN HALF STATER. Electrum. Incuse square with cruciform ornament.
 3. SILVER COIN OF TEOS. Incuse square. Circa 544 B. C.
 4. SILVER COIN OF ACANTHUS. Incuse square.
 5. SILVER COIN OF MENDE. Incuse triangles.
 6. SILVER COIN OF TERONE. Incuse square.
 7. COIN OF BISALTÆ.¹ Incuse square. Octadrachm.
 8. SILVER COIN OF ORRESCII.¹ Incuse square. Octadrachm.
 9. CORINTHIAN SILVER COIN. Incuse square divided into eight triangular compartments. The earliest coin of Corinth, dating B. C. 625 to 585.
 10. SILVER COIN OF ABDERA. Incuse square.
 11. SILVER COIN OF BYZANTIUM. Incuse square, granulated.
 12. SILVER COIN OF THRASOS (THRACE). Incuse square.

¹ The Bisaltæ and Orrescii were Thracian tribes who dwelt in the valleys of the Strymon and the Angites, to the north of the Pangæan Range.



PUNCH MARKS ON REVERSE OF ANCIENT COINS.

itself into the square habitually employed for that purpose. If the punch mark on this Corinthian coin be a Swastika, it depends upon the failure to make the extreme end of the bent arm an eighth of an inch longer. This is too fine a point to be relied upon. If this punch mark had these arms lengthened an eighth of an inch, it would confessedly become a square.

Swastika on ancient Hindu coins.—It is not to be inferred from this opposition that the Swastika never appeared on ancient coins. It did appear, but seems to have been of a later date and to have belonged farther east among the Hindus. Fig. 230 shows an ancient (Hindu?) coin reported by Waring, who cites Cunningham as authority for its having been found at Ujain. The design consists of a cross with independent circles on the outer end of each of the four arms, the circles being large enough to intersect each other. The field of each of these circles bears a Swastika of normal form. Other coins are cited of the same style, with small center dots and concentric circles in the stead of the Swastika. What meaning the Swastika has here, beyond the possible one of being a lucky penny, is not suggested.

Other ancient Hindu coins bearing the Swastika (figs. 231–234) are attributed to Cunningham by Waring.² These are said by Waring to be Buddhist coins found at Behat near Scharaupur. Mr. E. Thomas, in his article on the “Earliest Indian Coinage,”³ ascribes them to the



Fig. 230.

ANCIENT HINDU COIN IN THE FORM OF A CROSS WITH A SWASTIKA ON THE EXTREMITY OF EACH ARM.¹

Waring, “Ceramic Art in Remote Ages,” pl. 41, fig. 18.



Fig. 231.



Fig. 232.



Fig. 233.



Fig. 234.

ANCIENT HINDU COINS WITH SWASTIKAS, NORMAL AND OGEE.

Waring, “Ceramic Art in Remote Ages,” pl. 41, figs. 20–24.

reign of Krananda, a Buddhist Indian king contemporary with or prior to Alexander, about 330 B. C.

The coins of Krananda,⁴ contemporary of Alexander the Great,⁵ bear the Swastika mark, associated with the principal Buddhist marks, the trisula, the stupa, sacred tree, sacred cone, etc. Waring says⁶ that according to Prinsep’s “Engravings of Hindu Coins,” the Swastika seems to disappear from them about 200 B. C., nor is it found on the

¹ See p. 788.

² “Ceramic Art in Remote Ages,” pl. 41, figs. 20–23.

³ Numismatic Chron. (new series), IV.

⁴ “La Migration des Symboles,” figs. 17, 123.

⁵ Edward Thomas, Journ. Royal Asiatic Soc. (new series), I, p. 475.

⁶ “Ceramic Art in Remote Ages,” p. 83.

Indo-Bactrian, the Indo-Sassanian, or the later Hindu or subsequent Mohammedan, and he gives in a note the approximate dates of these dynasties: Early native Buddhist monarchs from about 500 B. C. to the conquest of Alexander, about 330 B. C.; the Indo-Bactrian or Greek successors of Alexander from about 300 to 126 B. C.; the Indo-Parthian or Scythic from about 126 B. C.; the second Hindu dynasty from about 56 B. C.; the Indo-Sassanian from A. D. 200 to 636, and subsequent to that the Indo-Mohammedan from the eleventh to the close of the thirteenth century; the Afghan dynasty from A. D. 1290 to 1526, and the Mongol dynasty to the eighteenth century, when it was destroyed by Nadir Shah. (See p. 772.)



Fig. 235.

ANCIENT COIN WITH
SWASTIKA.

Gaza, Palestine.

Waring, "Ceramic Art in
Remote Ages," pl. 42, fig. 6.

bear the inscription $ME\S\Upsilon\Upsilon$, which Greg² believes refers by a kind of pun to the name of the city, and so to noon, or the sun or solar light. The answer to this is the same given throughout this paper, that it may be true, but there is no evidence in support of it. Max Müller³ argues that this specimen is decisive of the meaning of the sign Swastika. Both these gentlemen place great stress upon the position which the Swastika held in the field relative to other objects, and so determine it to have represented the sun or sunlight; but all this seems *non sequitur*. A coin from Gaza, Palestine, ancient, but date not given, is attributed to R. Rochette, and by him to Munter (fig. 235). The Swastika sign is not perfect, only two arms of the cross being turned, and not all four.

Swastika on Danish gold bracteates.—Fig. 236 represents a Danish gold bracteate with a portrait head, two serpents, and a Swastika with the outer ends finished with a curve or flourish similar to that of the Jains (fig. 33).

There are other bracteates with the Swastika mark, which belong to the Scandinavian countries.⁴ Some of them bear signs referring to Christian civilization, such as raising hands in prayer; and from a determination of the dates afforded by the coins and other objects the Swastika can be identified as having continued into the Christian era.

The coinage of the ancient world is not a prolific field for the dis-



Fig. 236.

GOLD BRACTEATE WITH JAIN
SWASTIKA.

Denmark.

Waring, "Ceramic Art in Remote
Ages," pl. 1, fig. 9.

¹ "Numismatic Chron.," pt. I, 1880. See p. 788 of this paper.

² *Archæologia*, XLVIII, pt. II, 1885, p. 306.

³ *Athenæum*, August 20, 1892.

⁴ "Viking Age," II, figs. 1307, 1309.

covery of the Swastika. Other specimens may possibly be found than those here given. This search is not intended to be exhaustive. Their negative information is, however, valuable. It shows, first, that some of the early stamps or designs on coins which have been claimed as Swastikas were naught but the usual punch marks; second, it shows a limited use of the Swastika on the coinage and that it came to an end in very early times. Numismatics afford great aid to archæology from the facility and certainty with which it fixes dates. Using the dates furnished by the coinage of antiquity, it is gravely to be questioned whether the prolific use of the Swastika in Asia Minor (of which we have such notable examples on specimens of pottery from the hill of His-sarlik, in Greece) did not terminate before coinage began, or before 480 B. C., when the period of finer engraving began, and it became the custom to employ on coins the figures of gods, of tutelary deities, and of sacred animals. Thus the use of the Swastika became relegated to objects of commoner use, or those having greater relation to superstition and folklore wherein the possible value of the Swastika as an amulet or sign with power to bring good luck could be better employed; or, as suggested by Mr. Greg, that the great gods which, according to him, had the Swastika for a symbol, fell into disrepute and it became changed to represent something else.

UNITED STATES OF AMERICA.

PRE-COLUMBIAN TIMES.

Fains Island and Toco Mounds, Tennessee.—That the Swastika found its way to the Western Hemisphere in prehistoric times can not be doubted. A specimen (fig. 237) was taken by Dr. Edward Palmer in the year 1881 from an ancient mound opened by him on Fains Island, 3 miles from Bainbridge, Jefferson County, Tenn. It is figured and described in the Third Annual Report of the Bureau of Ethnology,¹ as follows:

A shell ornament, on the convex surface of which a very curious ornamental design has been engraved. The design, inclosed by a circle, represents a cross such as would be formed by two rectangular tablets or slips slit longitudinally and interlaced at right angles to each other. The lines are neatly and deeply incised. The edge of the ornament has been broken away nearly all around.

The incised lines of this design (fig. 237) represent the Swastika turned to the left (though the description does not recognize it as such). It has small circles with dots in the center, a style of work that may become of peculiar value on further investigation, but not to be confounded with the dots or points in what M. Zmigrodzki calls the *Croix swasticale*. The mound from which this specimen came, and the objects associated with it, show its antiquity and its manufacture by the aborigines untainted by contact with the whites. The mound is on the

¹Page 436, fig. 140.

east end of Fains Island. It was 10 feet in height and about 100 feet in circumference at the base. In the bed of clay 4 feet beneath the surface were found the remains of 32 human skeletons; of these, only 17 skulls could be preserved. There had been no regularity in placing the bodies.

The peculiar form of this Swastika is duplicated by a Runic Swastika in Sweden, cited by Ludwig Müller and by Count d'Alviella.¹

The following objects were found in the mound on Fains Island associated with the Swastika shell (fig. 237) and described, and many of them figured:² A gorget of the same *Fulgur* shell (fig. 239); a second gorget of *Fulgur* shell with an engraved spider (fig. 278); a pottery vase with a figure of a frog; three rude axes from four to seven inches in length, of diorite

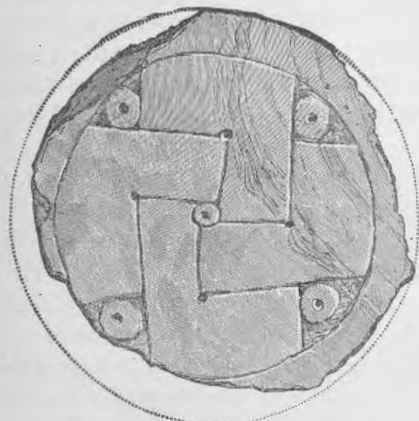


Fig. 237.

SHELL GORGET WITH ENGRAVED SWASTIKA, CIRCLES,
AND DOTS.

Fains Island, Tennessee.

Cat. No. 62928 U. S. N. M.

and quartzite; a pierced tablet of slate; a disk of translucent quartz $1\frac{3}{4}$ inches in diameter and three-quarters of an inch in thickness; a mass of pottery, much of it in fragments, and a number of bone implements, including needles and paddle-shaped objects. The shell objects (in addition to the disks and gorgets mentioned) were pins made from the columellæ of *Fulgur* (*Busycon perversum*?) of the usual form and about four inches in length. There were also found shell beads, cylindrical in form, an inch in length and upward of an inch in diameter, with other beads of various sizes and shapes made from marine shells, and natural specimens of *Io spinosa*, *Unio probatus*.

The specimen represented in fig. 238 is a small shell from the Big Toco mound, Monroe County, Tenn., found by Mr. Emmert with skeleton No. 49 and is fig. 262, Twelfth Annual Report of the Bureau of Ethnology, 1890-91, page 383, although it is not described. This is a circular disk of *Fulgur*

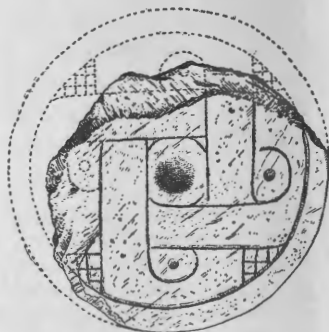


Fig. 238.

ENGRAVED SHELL WITH SWASTIKA, CIRCLES,
AND DOTS.

Toco Mound, Monroe County, Tenn.

Cat. No. 115624, U. S. N. M.

¹ Proc. Royal Danish Acad. Sci., 5th ser., III, p. 94, fig. a; "La Migration des Symboles," p. 50, fig. 16.

² Third Ann. Rep. Bureau of Ethnology, 1881-82, p. 464 et seq., figs. 139-141.



ENGRAVED FULGUR (?) SHELL, RESEMBLING STATUE OF BUDDHA.

Toco Mound, Tennessee.

Cat. No. 115560, U. S. N. M.

shell, much damaged around the edge, $1\frac{1}{2}$ inches in diameter, on which has been engraved a Swastika. It has a small circle and a dot in the center, around which circle the arms of the Swastika are interlaced. There are also circles and central dots at each turn of the four arms. The hatch work in the arc identifies this work with that of other crosses and a triskelion from the same general locality—figs. 302, 305, and 306, the former being part of the same find by Mr. Emmert. Fig. 222, a bronze gilt fibula from Berkshire, England, bears a Swastika of the same style as fig. 238 from Tennessee. The circles and central dots of fig. 238 have a similarity to Peruvian ornamentation. The form and style, the broad arms, the circles and central dots, the lines of engravings, show such similarity of form and work as mark this specimen as a congener of the Swastika from Fains Island (fig. 237). The other objects found in the mound associated with this Swastika will be described farther on.

There can be no doubt of these figures being the genuine Swastika, and that they were of aboriginal workmanship. Their discovery immediately suggests investigation as to evidences of communication with the Eastern Hemisphere, and naturally the first question would be, Are there any evidences of Buddhism in the Western Hemisphere? When I found, a few days ago, the two before-described representations of Swastikas, it was my belief that no reliable trace of Buddha or the Buddhist religion had ever been found among the aboriginal or prehistoric Americans. This statement was made, as almost all other statements concerning prehistoric man should be, with reserve, and subject to future discoveries, but without idea that a discovery of evidence on the subject was so near. In searching the U. S. National Museum for the objects described in the Second Annual Report of the Bureau of Ethnology under the title of "Art in Shell among the Ancient Americans," the writer discovered a neglected specimen of a mutilated and damaged shell (pl. 10), marked as shown on the back, found by Mr. Emmert, an employé of the Bureau of Ethnology, in the year 1882. Its original field number was 267, Professor Thomas's 6542, the Museum number 115562, and it was found in the Big Toco mound, Monroe County, Tenn. It is not figured nor mentioned in any of the Bureau reports. It is greatly to be regretted that this shell is so mutilated. In its present condition no one can say positively what it is, whether a statue of Buddha or not; but to all appearances it represents one of the Buddhist divinities. Its material, similar to the hundred others found in the neighborhood, shows it to have been indigenous, yet parts of its style are different from other aboriginal North American images. Attention is called to the slim waist, the winged arms, the crossed legs, the long feet, breadth of toes, the many dots and circles shown over the body, with triple lines of garters or anklets. All these show a different dress from the ancient North American. The girdle about the waist, and the triangular dress which, with its decorations and arrangement

of dots and circles, cover the lower part of the body, are to be remarked. While there are several specimens of aboriginal art from this part of the country which bear these peculiarities of costumes, positions, appearance, and manner of work, showing them to have been in use among a portion of the people, yet they are not part of the usual art products. There is a manifest difference between this and the ordinary statue of the Indian or of the mound builder of that neighborhood or epoch.

It is not claimed that this shell proves the migration of Buddhism from Asia, nor its presence among North American Indians. "One swallow does not make a summer." But this figure, taken in connection with the Swastika, presents a set of circumstances corresponding with that possibility which goes a long distance in forming circumstantial evidence in its favor.

M. Gustave d'Eichthal wrote a series of essays in the *Revue Archæologique*, 1864-65, in which he collated the evidence and favored the theory of Buddhist influence in ancient America. Other writers have taken the same or similar views and have attributed all manner of foreign influence, like the Lost Tribes of Israel, etc., to the North American Indian,¹ but all these theories have properly had but slight influence in turning public opinion in their direction. Mr. V. R. Gandhi, in a recent letter to the author, says of this specimen (pl. 10):

While Swastika technically means the cross with the arms bent to the right, later on it came to signify anything which had the form of a cross; for instance, the posture in which a persons sits with his legs crossed is called the Swastika posture;² also when a person keeps his arms crosswise over his chest, or a woman covers her breast with her arms crossed, that particular attitude is called the Swastika attitude, which has no connection, however, with the symbolic meaning of the Swastika with four arms. The figure [pl. 10], a photograph of which you gave me the other day, has the same Swastika posture. In matters of concentration and meditation, Swastika posture is oftentimes prescribed, which is also called Sukhasana, meaning a posture of ease and comfort. In higher forms of concentration, the posture is changed from Sukhasana to Padmasana, the posture which is generally found in Jain and Buddhist images. The band around the waist, which goes from the navel lower on till it reaches the back part, has a peculiar significance in the Jain philosophy. The Shvetamber division of the Jain community have always this kind of band in their images. The object is twofold: The first is that the generative parts ought not to be visible; the second is that this band is considered a symbol of perfect chastity.

There can be no doubt of the authenticity of these objects, nor any suspicion against their having been found as stated in the labels attached. They are in the Museum collection, as are other specimens. They come unheralded and with their peculiar character unknown. They were obtained by excavations made by a competent and reliable investigator who had been engaged in mound exploration, a regular employé of the Bureau of Ethnology, under the direction of Prof.

¹This theory was first announced by Antonio de Montezinos and published by MANASSEH ben ISRAEL in Amsterdam, 1636. In Leser Library, Phil., and Cohen Library, Balto. Catalogued by Dr. Cyrus Adler. First English Ed. by Moses Wall, London: 1651, republished by Dr. Grossmann, Am. Jews' Annual, 1889, p. 83.

²Max Müller and Ohnefalsch-Richter agree with this. See pp. 772, 773 of this paper.

Cyrus Thomas during several years, and always of good reputation and unblemished integrity. They come with other objects, labeled in the same way and forming one of a series of numbers among thousands. Its resemblance to Buddhist statues was apparently undiscovered or unrecognized, at least unmentioned, by all those having charge of it, and in its mutilated condition it was laid away among a score of other specimens of insufficient value to justify notice or publication, and is now brought to light through accident, no one having charge of it recognizing it as being different from any other of the half hundred engraved shells theretofore described. The excavation of Toco mound is described by Professor Thomas in the Twelfth Annual Report of the Bureau of Ethnology, pages 379-384.

We can now be governed only by the record as to the objects associated with this shell (pl. 10), which shows it to have been found with skeleton No. 8, in Big Toco mound, Monroe County, Tenn., while the Swastika of figure 238 was found with skeleton No. 49. Toco mound contained fifty-two skeletons, or, rather, it contained buried objects reported as from that many skeletons. Those reported as with skeleton No. 8 were, in addition to this gorget: One polished stone hatchet, one stone pipe, and one bowl with scalloped rim. Toco mound seems to have been exceedingly rich, having furnished 198 objects of considerable importance. Association of discovered objects is one of the important means of furnishing evidence in prehistoric archæology. It is deemed of sufficient importance in the present case to note objects from Toco mound associated with the Buddha statue. They are given in list form, segregated by skeletons:

Skeleton No.

4. Two polished stone hatchets, one discoidal stone.
5. One polished stone hatchet.
7. Two large seashells.
8. One stone pipe, one polished stone hatchet, one ornamented shell gorget (the Buddha statue, pl. 10), one ornamented bowl, with scalloped rim.
9. Two polished stone hatchets.
12. A lot of small shell beads.
13. Four bone implements (one ornamented), one stone pipe, two shell gorgets (one ornamented), one bear tooth.
17. One polished stone hatchet.
18. Two polished stone hatchets, one stone pipe, one boat-shaped bowl (ornamented), one shell gorget (ornamented), one shell mask, one shell pin, one shell gorget, one bear tooth, lot of shell beads.
22. Two polished stone chisels, one stone disk.
24. One polished stone hatchet.
26. Two polished stone hatchets, one waterworn stone, two hammer stones.
27. One polished stone hatchet.
28. Two polished stone hatchets, one ornamented bowl.
31. One polished stone hatchet, one polished stone chisel.
33. Two polished stone hatchets, one two-eared pot, one small shell gorget, three shell pins, fragments of pottery.
34. Three polished stone hatchets.
36. One discoidal stone.

Skeleton No.

37. One polished stone chisel, one stone pipe, one shell mask (ornamented).
41. One polished stone hatchet, one stone pipe, pottery vase with ears (ornamented), one shell mask, one shell pin, four arrowheads (two with serrated edges), two stone perforators.
43. Lot of shell beads.
49. One polished stone hatchet, one spade-shaped stone ornament (perforated), one spear-head, one stone pipe, one pottery bowl with two handles, two shell masks (ornamented), twenty-seven bone needles, two beaver teeth, one bone implement (raccoon), piece of mica, lot of red paint, two shell gorgets (one ornamented with Swastika, fig. 238), thirty-six arrow-heads, lot of flint chips, fragment of animal jaw and bones, lot of large shells, one image pot.
51. One shell pin, one shell mask, one arrow-head, two small shell beads.
52. One shell mask, one shell gorget, one shell ornament.

These objects are now in the U. S. National Museum and in my department. The list is taken from the official catalogue, and they number from 115505 to 115684. I have had the opportunity of comparing the objects with this description and find their general agreement. Dr. Palmer, the finder, was an employé of the Bureau of Ethnology, is a man of the highest character, of great zeal as an archæologist and naturalist, and has been for many years, and is now, in the employ of the Bureau or Museum, always with satisfaction and confidence. Mr. Emmert was also an employé of the Bureau for many years, and equally reliable.

The specimens of shell in this and several other mounds, some of which are herein figured, were in an advanced stage of decay, pitted, discolored, and crumbling, requiring to be handled with the utmost care to prevent disintegration. They were dried by the collector, immersed in a weak solution of glue, and forwarded immediately (in 1885), with other relics from the neighborhood, to the Bureau of Ethnology and National Museum at Washington, where they have remained ever since. There is not the slightest suspicion concerning the genuineness or antiquity of this specimen or of those bearing the Swastika as belonging to the mound-building epoch in the valley of the Tennessee.

Other figures of sufficient similarity to the Swastika have been found among the aborigines of North America to show that these do not stand alone; and there are also other human figures which show a style of work so similar and such resemblance in detail of design as to establish the practical identity of their art. One of these was a remarkable specimen of engraved shell found in the same mound, Fains Island, which contained the first Swastika (fig. 237). It is described in the Second Annual Report of the Bureau of Ethnology, page 301, under the name of McMahan's mound. It is a large polished Fulgur shell disk which, when entire, has been nearly 5 inches in diameter (fig. 239). A little more than one-third has crumbled away, and the remaining portion has been preserved only by careful handling and immediate immersion in a solution of glue. It had been engraved on the concave side. The design represents two human figures plumed and winged,

armed with eagles' talons and engaged in mortal combat. The design apparently covered the entire shell, leaving no space for encircling lines. The two figures are in profile and face each other in a fierce onset. Of the right-hand figure, only the body, one arm, and one leg remain. The left-hand figure is almost complete. The outline of the face, one arm, and one foot is all that is affected. The right hand is raised above the head in the act of brandishing a long knife pointed at both ends. The other combatant, clutching in his right hand a savage-looking



Fig. 239.

SHELL GORGET.

Two fighting figures with triangular breech-clout, garters and anklets, and dots and circles.
Fains Island, Tennessee.

Third Annual Report of the Bureau of Ethnology, p. 462, fig. 128.

Cat. No. 62930, U. S. N. M.

blade with its point curved, seems delivering a blow in the face of his antagonist. Of the visible portions of the figures, the hands are vigorously drawn, the thumbs press down upon the outside of the forefingers in a natural effort to tighten the grasp. The body, arms, and legs are well defined and in proper proportion, the joints are correctly placed, the left knee is bent forward, and the foot planted firmly on the ground, while the right is thrown gracefully back against the rim at the left, and the legs terminate in well-drawn eagles' feet armed with curved

talons. The head is decorated with a single plume which springs from a circular ornament placed over the ear; an angular figure extends forward from the base of this plume, and probably represents what is left of the headdress proper. In front of this—on the very edge of the



Fig. 240.

COPPER PLATE.

Entowah Mound, Georgia.

Fifth Annual Report of the Bureau of Ethnology, fig. 42.

Cat. No. 91113, U. S. N. M.

crumbling shell—is one-half of the lozenge-shaped eye, the dot representing the pupil being almost obliterated. The ankles and legs just below the knee and the wrists each have three lines representing bracelets or anklets. It is uncertain whether the leg is covered or naked; but between the waistband and the leggings, over the abdomen, is represented on both figures a highly decorated triangular garment, or, possibly coat of mail, to which particular attention is called.¹ In the center, at the top, just under the waistband, are four circles with dots in the center arranged in a square; outside of this, still at the top, are two triangular pieces, and outside of them are two more circles and dots; while the lower part of the triangle, with certain decorations of incised lines, completes the garment. This decoration is the same on both figures, and corresponds exactly with the Buddha figure. An ornament is suspended on the breast which shows three more of the circles and dots. The earring is still another. The right-hand figure, so far as it can be seen, is a duplicate of the left, and in the drawing

it has, where destroyed, been indicated by dotted lines. It is remarkable that the peculiar clothing or decoration of these two figures should be almost an exact reproduction of the Buddha figure (pl. 10). Another

¹ Cf. Ghandi, p. 882, of this paper.

interesting feature of the design is the highly conventionalized wing which fills the space beneath the uplifted arm. This wing is unlike the usual specimens of aboriginal art which have been found in such profusion in that neighborhood. But it is again remarkable that this conventionalized wing and the bracelets, anklets, and garters should correspond in all their peculiarities of construction and design with the



Fig. 241.

COPPER PLATE.

Repoussé work.

Etowah Mound, Georgia.

Cat. No. 91117, U. S. N. M.

wings on the copper and shell figures from the Etowah mound, Georgia (figs. 240, 241, and 242)¹. Behind the left-hand figure is an ornament resembling the spreading tail of an eagle which, with its feather arrangement and the detail of their mechanism, correspond to a high degree with the eagle effigies in repoussé copper (fig. 243) from the mound in

¹ Fifth Ann. Rep. Bureau of Ethnology, 1883-84, pp. 96-106, figs. 42, 43, 45.

Union County, Ill., shown in the Fifth Annual Report of the Bureau of Ethnology (p. 105) and in the Twelfth Annual Report (p. 309).

Hopewell Mound, Chillicothe, Ross County, Ohio.—A later discovery of the Swastika belonging to the same period and the same general locality—that is, to the Ohio Valley—was that of Prof. Warren K. Moorehead, in the fall and winter of 1891–92, in his excavations of the Hopewell mound, seven miles northwest of Chillicothe, Ross County, Ohio.¹ The locality of this mound is well shown in Squier and Davis's work on the "Monuments of the Mississippi Valley" (pl. 10, p. 26), under the name of "Clark's Works," here reproduced as pl. 11. It is the large irregular



Fig. 242.

ENGRAVED SHELL.

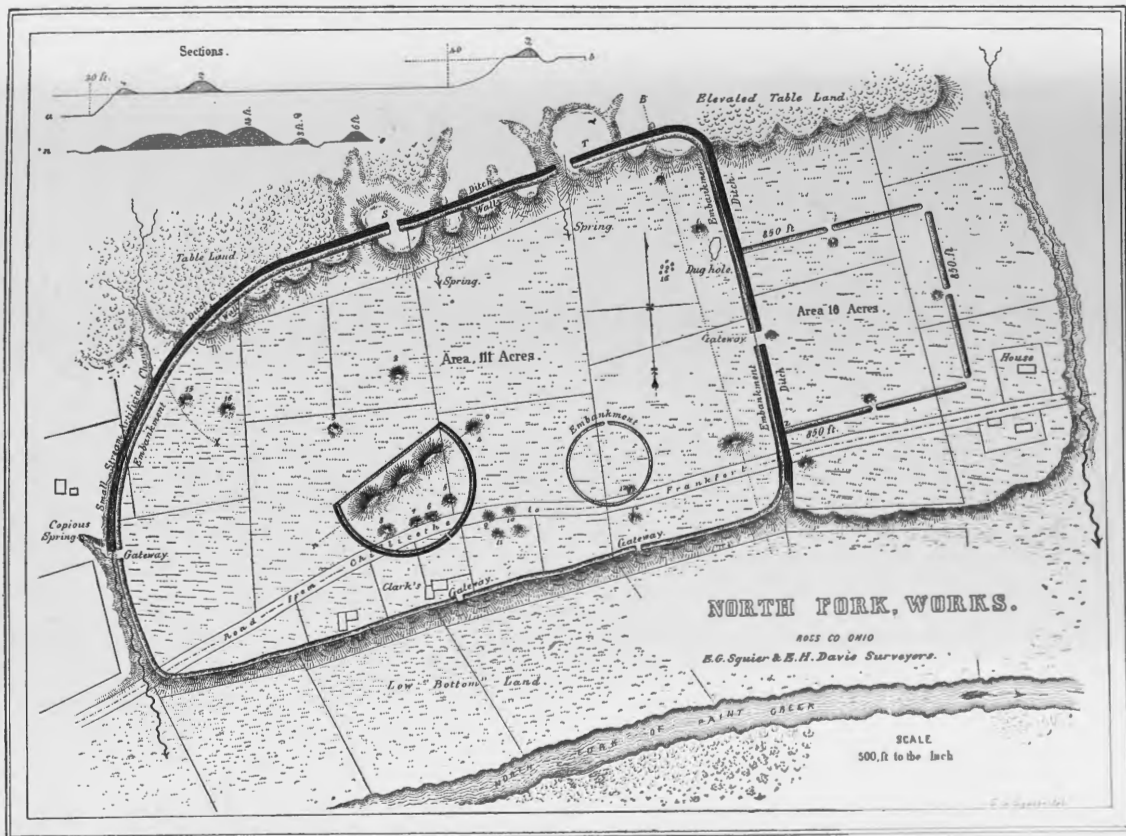
Triangular breech-clout with dots and circles.

Entowah Mound, Georgia.

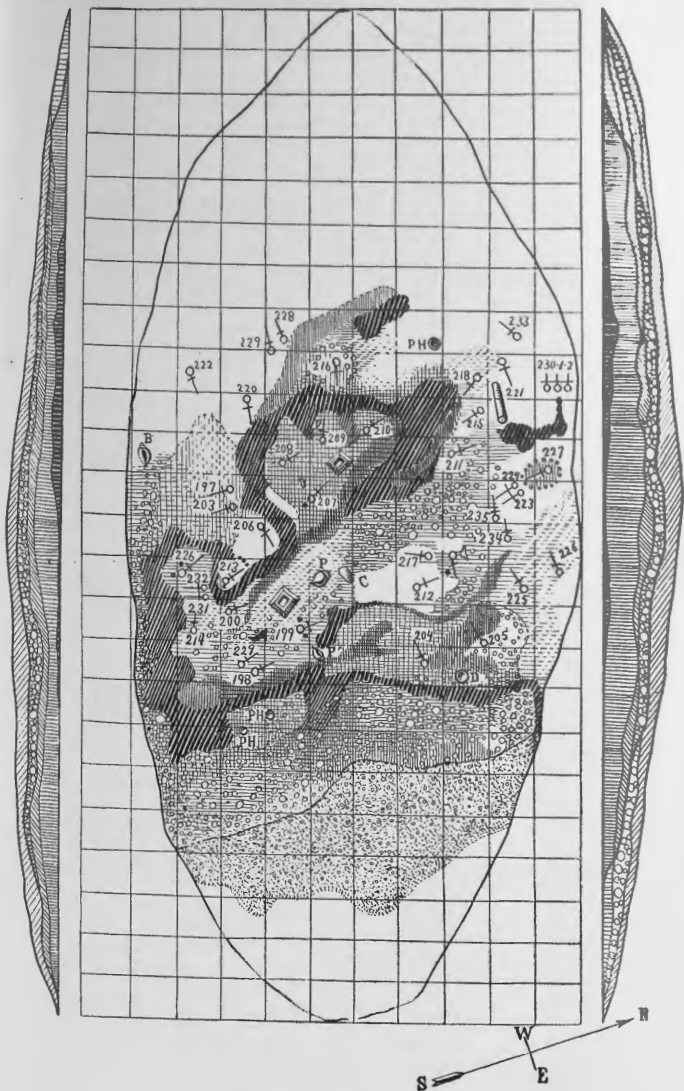
Cat. No. 91443, U. S. N. M.

unnumbered triple mound just within the arc of the circle shown in the center of the plan. The excavation contemplated the destruction of the mound by cutting it down to the surrounding level and scattering the earth of which it was made over the surface; and this was done. Preparatory to this, a survey and ground plan was made (pl. 12). I assisted at this survey and can vouch for the general correctness. The mound was surrounded by parallel lines laid out at right angles and marked by stakes 50 feet apart. The mound was found to be 530 feet long and 250 feet wide. Squier and Davis reported its height at 32 feet, but the excavation of the trenches required but 18 and 16 feet to the original surface on which the mound was built. It was too large to be cut down as a whole, and for convenience it was decided by Mr. Moorehead to cut it down in trenches, commencing on the northeast. Nothing was found until, in opening trench 3, about five feet above the base of the mound, they struck a mass of thin worked copper objects, laid flat one atop the other, in a rectangular space, say three by four feet square. These objects are unique in American prehistoric archaeology. Some of them bore a resemblance in form to the scalloped mica pieces found by Squier and Davis, and described by them in

¹These explorations were made for the Department of Ethnology at the World's Columbian Exposition, Chicago, 1893.



PLAN OF NORTH FORK (HOPEWELL) WORKS.
Ross County, Ohio.
Smithsonian Contributions to Knowledge, Vol. I, Pl. X.



PLAN OF HOPEWELL MOUND, IN WHICH ABORIGINAL COPPER SWASTIKAS WERE FOUND.

Ross County, Ohio.

Moorehead, "Primitive Man in Ohio," Pl. xxxiv.

their "Ancient Monuments of the Mississippi Valley" (p. 240), and also those of the same material found by Professor Putnam in the Turner group of mounds in the valley of the Little Miami. They had been apparently laid between two layers of bark, whether for preservation or mere convenience of deposit, can only be guessed.

The following list of objects is given, to the end that the reader may see what was associated with these newly found copper Swastikas: Five Swastika crosses (fig. 244); a long mass of copper covered with wood on one side and with squares and five similar designs traceable on the reverse; smaller mass

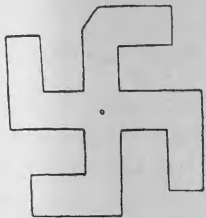


Fig. 241.

SWASTIKA CROSS OF THIN COPPER.

Hopewell Mound, Ross County, Ohio.

$\frac{1}{4}$ natural size.

one set of two; five pan lids or hat-shaped rings; ten circular disks with holes in center, represented in fig. 245, originally placed in a pile and now oxidized together;

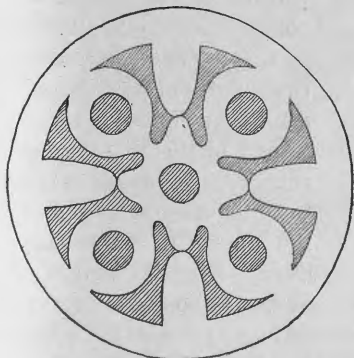


Fig. 246.

STENCIL ORNAMENT OF THIN COPPER.
Hopewell Mound, Ross County, Ohio.

$\frac{1}{3}$ natural size.

beads, shown in the list below, laid in rectangular form about seven feet in length and five feet in width, and so close as to frequently overlap.



Fig. 243.

COPPER PLATE SHOWING FIGURE OF EAGLE.

Repoussé work.

Union County, Ill.

Cat. No. 91507, U. S. N. M.

of copper; eighteen single copper rings; a number of double copper rings, one set of three and one set of two; five pan lids or hat-shaped rings; ten circular disks with holes in center, represented in fig. 245, originally placed in a pile and now oxidized together; also large circular, stencil-like ornaments, one (fig. 246) $7\frac{1}{2}$ inches in diameter; another (fig. 247) somewhat in the shape of a St. Andrew's cross, the extreme length over the arms being $8\frac{3}{4}$ inches.

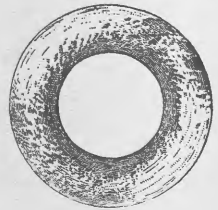


Fig. 245.

FLAT RING OF THIN COPPER.

Hopewell Mound, Ross County, Ohio.

$\frac{1}{3}$ natural size.

About five feet below the deposit of sheet copper and 10 or 12 feet to the west, two skeletons lay together. They were covered with copper plates and fragments, copper hatchets, and pearl

There were also found sixty-six copper hatchets, ranging from $1\frac{1}{2}$ to $22\frac{1}{2}$ inches in length; twenty-three copper plates and fragments; one copper eagle; eleven semicircles, bars, etc.; two spool-shaped objects; four comb-shaped effigies; one wheel with peculiar circles and bars of copper; three long plates of copper; pearl and shell beads and teeth; a lot of extra fine pearls; a lot of wood, beads, and an unknown metal; a lot of bones; a human jaw, very large; a fragmentary fish resembling a sucker (fig. 248); one stool of copper with two legs; broken copper plates; one broken shell; bear and panther tusks;



Fig. 247.

STENCIL ORNAMENT OF
THIN COPPER.Hopewell Mound, Ross
County, Ohio. $\frac{3}{4}$ natural size.

mica plates; forty fragmentary and entire copper stencils of squares, circles, diamonds, hearts, etc.; copper objects, saw-shaped; twenty ceremonial objects, rusted or oxidized copper; two diamond-



Fig. 248.

FISH ORNAMENT OF THIN COPPER.

Hopewell Mound, Ross County, Ohio.

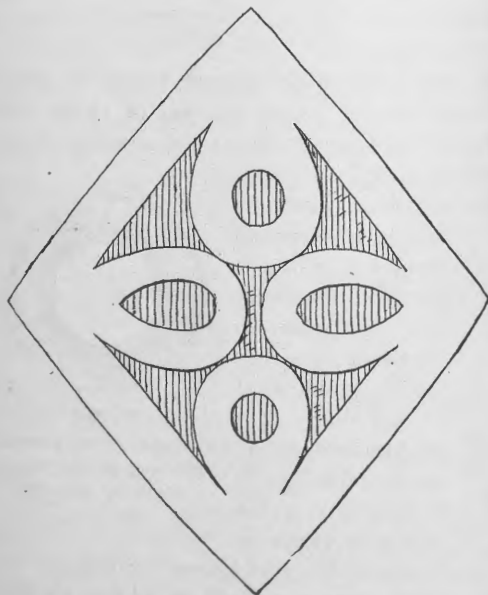
 $\frac{1}{2}$ natural size.

Fig. 249.

LOZENGE-SHAPED STENCIL OF THIN COPPER.

Hopewell Mound, Ross County, Ohio.

 $\frac{3}{4}$ natural size.

shaped stencils, copper (fig. 249); four peculiar spool-shaped copper ornaments, perforated, showing repoussé work (fig. 250).

I made sketches of two or three of the bone carvings, for the purpose of showing the art of the people who constructed this monument, so that by comparison with that of other known peoples some knowledge may be obtained, or theory advanced, concerning the race or tribe to which they belonged and the epoch in which they lived. Fig. 251 shows an exquisite bone carving of a paroquet which belongs much farther south and not found in that locality in modern times. The design shown in fig. 252 suggests

a Mississippi Kite, but the zoologists of the Museum, while unable to determine with exactitude its intended representation, chiefly from the mutilated condition of the fragment, report it more likely to be the



HUMAN SKULL WITH COPPER-COVERED HORNS.
Hopewell Mound, Ross County, Ohio.
Moorehead, "Primitive Man in Ohio," frontispiece.



PREHISTORIC ALTAR.

Hopewell Mound, Ross County, Ohio.

Found near the copper Swastika shown in fig. 244.

Moorehead, "Primitive Man in Ohio", Fig. xxxvii. Cat. No. 148662, U. S. N. M.

head of the "leather-back" turtle. Fig. 253 probably represents an otter with a fish in his mouth.

In trench No. 3, 15 skeletons (numbered 264 to 278, inclusive), were found on the base line, all extended. Objects of coal, bone, shell, or stone, had been placed with nearly all of them. Nos. 265 and 266 were laid on blocks of burnt earth 3 inches higher than the base of the mound. One of the skeletons in this mound (No. 248) is shown in pl. 13. It was a most remarkable specimen, and forms the frontispiece of Prof. W. K. Moorehead's volume "Primitive Man in Ohio," where it is described (p. 195) as follows:

At his head were imitation elk horns, neatly made of wood and covered with sheet copper rolled into cylindrical forms over the prongs. The antlers were 22 inches

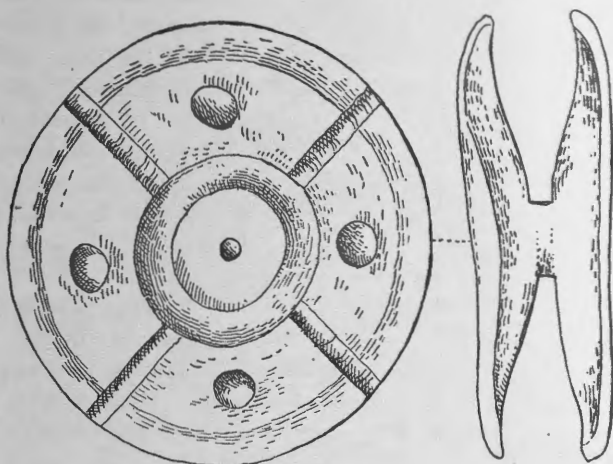


Fig. 250.

SPOOL-SHAPED OBJECT OF COPPER.

Repoussé and intaglio decoration.

Hopewell Mound, Ross County, Ohio.

Natural size.

high and 19 inches across from prong to prong. They fitted into a crown of copper bent to fit the head from occipital to upper jaw. Copper plates were upon the breast and stomach, also on the back. The copper preserved the bones and a few of the sinews. It also preserved traces of cloth similar to coffee sacking in texture, interwoven among the threads of which were 900 beautiful pearl beads, bear teeth split and cut, and hundreds of other beads, both pearl and shell. Copper spool-shaped objects and other implements covered the remains. A pipe of granite and a spear-head of agate were near the right shoulder. The pipe was of very fine workmanship and highly polished.

While digging out skeletons 280 to 284, Professor Moorehead says they touched the edge of an altar (pl. 14). It was on the base line and 15 feet north of the copper find before described. On the 5th of January, 1892, the altar was uncovered, and the earth, charcoal, and objects within it put into five soap boxes and transported to headquarters,

where the material was assorted in my presence and with my aid. The mass on the altar had been charred throughout. It contained, in part, mica ornaments, beads, spool-shaped objects, whale, bear, and panther teeth, flint knives, carved effigies of bone and stone, some of which were broken, while others were whole. There were stone tablets, slate orna-

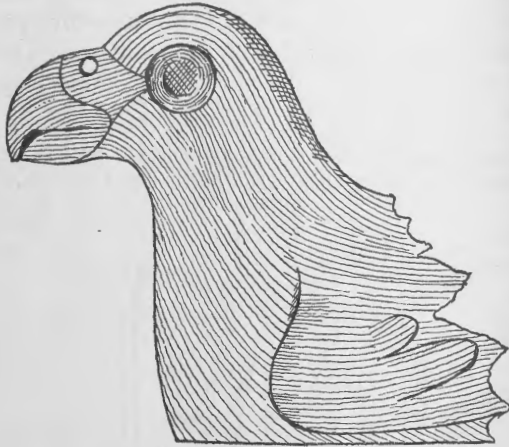


Fig. 251.

FRAGMENT OF ENGRAVED BONE REPRESENTING A PAROQUET.

Hopewell Mound, Ross County, Ohio.

Natural size.

ments, copper balls, fragments of cloth, rings of chlorite, quartz crystals perforated and grooved, and a few pieces of flint and obsidian, with several thousand pearls drilled for suspension. These objects were heaped in the cavity of the altar without any regularity. All were affected by heat, the copper being fused in many cases. The teeth and tusks were charred, split, and calcined. There were no ashes. All the fuel was charcoal, and from the appearance of the débris, especially the wood, earth, and bone, one might suppose that after the fire had started it had not been allowed to burn to ashes as if in the open air, but had been covered with earth, and so had smoldered out as in a charcoal pit.

Evidence was found of an extended commerce with distant localities, so that if the Swastika existed in America it might be expected here. The principal objects were as follows: A number of large seashells (*Fulgur*) native to the southern Atlantic Coast 600 miles distant, many of them carved; several thousand pieces of mica from the mountains of Virginia or North Carolina, 200 or more miles distant; a thousand large blades of beautifully chipped objects in obsidian, which could not have been found nearer than the Rocky Mountains, 1,000 or 1,200 miles distant; four hundred pieces of wrought copper, believed to be from the Lake Superior region, 150 miles distant; fifty-three skeletons, the copper headdress (pl. 13) made in semblance of elk horns, 16 inches high, and other wonderful things. Those not described have no relation to the Swastika.

ments, copper balls, fragments of cloth, rings of chlorite, quartz crystals perforated and grooved, and a few pieces of flint and obsidian, with several thousand pearls drilled for suspension. These objects were heaped in the cavity of the altar without any regularity. All were affected by heat, the copper being fused in many cases. The teeth and tusks were charred, split, and calcined. There were no ashes. All the fuel was charcoal, and from the appearance of the débris, especially the wood, earth, and bone, one might suppose that after the fire had started it had not been allowed to burn to ashes as if in the open air, but had been covered with earth, and so had smoldered out as in a charcoal pit.

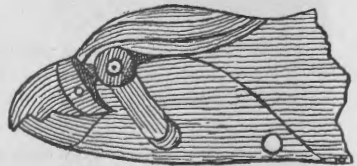


Fig. 252.

FRAGMENT OF ENGRAVED BONE PROBABLY REPRESENTING A MISSISSIPPI KITE OR LEATHER-BACK TURTLE.

Hopewell Mound, Ross County, Ohio.

Natural size.

These objects were all prehistoric. None of them bore the slightest evidence of contact with white civilization. The commoner objects would compare favorably with those found in other mounds by the same and other investigators. Much of it may be undetermined. It is strange to find so many objects brought such long distances, and we may not be able to explain the problem presented; but there is no authority for injecting any modern or European influence into it. By what people were these made? In what epoch? For what purpose! What did they represent? How did this ancient, curious, and widespread sign, a recognized symbol of religion of the Orient, find its way to the bot-

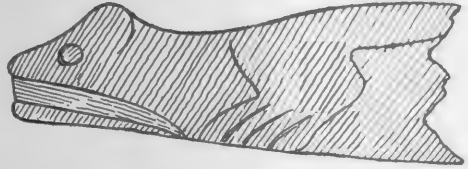


Fig. 253.

FRAGMENT OF ENGRAVED BONE PROBABLY REPRESENTING AN OTTER WITH A FISH IN ITS MOUTH.

Natural size.



Fig. 254.

WATER JUG WITH FIGURE OF SWASTIKA.

Decoration, red on yellow ground.

Poinsett County, Ark.

Cat. No. 91230, U. S. N. M.

tom of one of the mounds of antiquity in the Scioto Valley? These are questions easy to ask but difficult to answer. They form some of the riddles of the science of prehistoric anthropology.

Mounds in Arkansas.—A water jug in the collection of the U. S. National Museum (fig. 254) was obtained in 1883 by P. W. Norris, of

the Bureau of Ethnology, from a mound in Poinsett County, Ark. It is of yellow ground, natural color of clay, and decorated with light red paint. The paint is represented in the cut by the darkened surfaces. The four quarters of the jug are decorated alike, one side of which is shown in the cut. The center of the design is the Swastika with the arm crossing at right angles, the ends turned to the right, the effect being produced by an enlargement on the right side of each arm until they all join the circle. A similar water jug with a Swastika mark of the same type as the foregoing decorates Major Powell's desk in the Bureau of Ethnology.

Marquis Nadaillac¹ describes and figures a grooved ax from Pemberton, N. J., on which some persons have recognized a Swastika, but which the Marquis doubts, while Dr. Abbott² denounces the inscription as a fraud.

NORTH AMERICAN INDIANS.

The Kansas.—The Rev. J. Owen Dorsey³ describes the mourning customs of the Kansas Indians. In the course of his description he tells of a council of ceremony held among these Indians to decide if they should go on the warpath. Certain sacred songs were sung which had been arranged according to a chart, which Mr. Dorsey introduces as pl. 20, page 676. The outside edge of this chart bore twenty-seven ideographs, which suggest or determine the song or speech required. No. 1 was the sacred pipe; No. 2, the maker of all songs; No. 3, song of another old man who gives success to the hunters; No. 4 (fig. 255 in the present paper) is the Swastika sign, consisting of two ogee lines intersecting each other, the ends curved to the left. Of it, Mr. Dorsey says only the following:

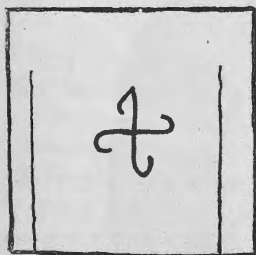


Fig. 255.

KANSAS INDIAN WAR CHART.

Swastika sign for winds and wind songs.

J. Owen Dorsey, *American Naturalist*, July, 1885, p. 670.

Fig. 4. Tadge wayun, wind songs. The winds are deities; they are Bazanta (at the pines), the east wind; Ak'a, the south wind; A'k'a jiŋga or A'k'uya, the west wind; and Hnia (toward the cold), the north wind. The warriors used to remove the hearts of slain foes, putting them in the fire as a sacrifice to the winds.

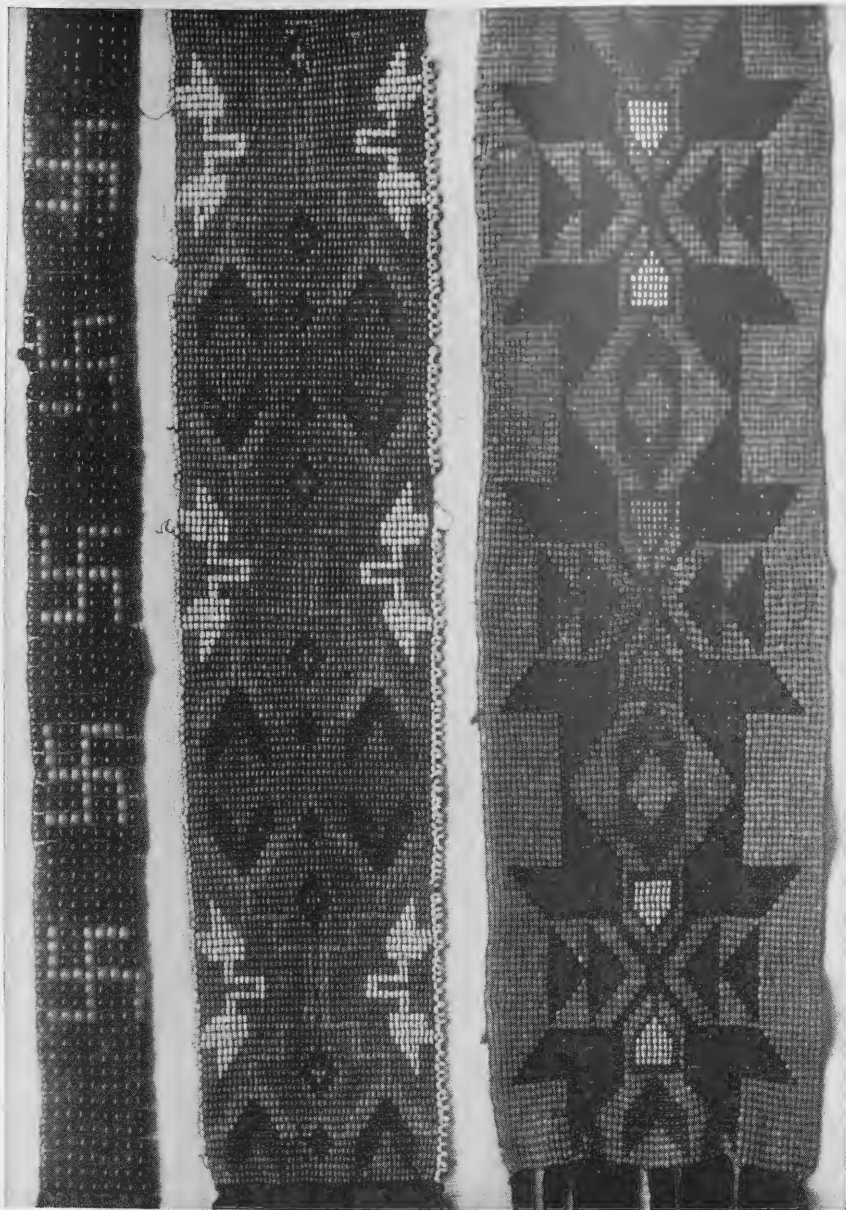
In the Eleventh Annual Report of the Bureau of Ethnology (p. 525) Mr. Dorsey repeats this statement concerning the names of the winds, and shows how, in their invocations, the Kansas began with the east wind and went around to the right in the order here given. His fig. 195 illustrates this, but the cross has straight arms. In response to my personal inquiry, Mr. Dorsey says the war chart⁴ was drawn for him, with the Swastika as represented, by Pahanle-gaqle, the war captain,

¹ "Prehistoric America," p. 22, note 24, fig. 9.

² "Primitive Industry," p. 32.

³ *American Naturalist*, XIX, July, 1885, p. 670.

⁴ *Ibid.*, pl. 20.



CEREMONIAL BEAD NECKLACE WITH SWASTIKA ORNAMENTATION.
Sac Indians, Cook County (Kansas) Reservation.

who had official charge of it and who copied it from one he had inherited from his father and his "father's fathers"; and Mr. Dorsey assured me that there can be no mistake or misapprehension about this Indian's intention to make the sign as there represented. Asked if the sign was common and to be seen in other cases or places, Mr. Dorsey replied that the Osage have a similar chart with the same and many other signs or pictographs—over a hundred—but except these, he knows of no similar signs. They are not in common use, but the chart and all it contains are sacred objects, the property of the two Kansas gentes, Black Eagle and Chicken Hawk, and not to be talked of nor shown outside of the gentes of the council lodge.¹

The Sac Indians.—Miss Mary A. Owen, of St. Joseph, Mo., sending some specimens of beadwork of the Indians (pl. 15) from the Kansas Reservation, two of which were garters and the third a necklace 13 inches long and 1 inch wide, in which the Swastikas represented are an inch square, writes, February 2, 1895, as follows:

The Indians call it [the Swastika] the "luck," or "good luck." It is used in necklaces and garters by the sun worshippers among the Kickapoos, Sacs, Pottawatomies, Iowas, and (I have been told) by the Winnebagoes. I have never seen it on a Winnebago. The women use the real Swastika and the Greek key pattern, in the silk patchwork of which they make sashes and skirt trimmings. As for their thinking it an emblem of fire or deity, I do not believe they entertain any such ideas, as some Swastika hunters have suggested to me. They call it "luck," and say it is the same thing as two other patterns which I send in the mail with this. They say they "always" made that pattern. They must have made it for a long time, for you can not get such beads as compose it, in the stores of a city or in the supplies of the traders who import French beads for the red folk. Another thing. Beadwork is very strong, and this is beginning to look tattered, a sure sign that it has seen long service.

These sun worshippers—or, if you please, Swastika wearers—believe in the Great Spirit, who lives in the sun, who creates all things, and is the source of all power and beneficence. The ancestors are a sort of company of animal saints, who intercede for the people. There are many malicious little demons who thwart the ancestors and lead away the people at times and fill them with diseases, but no head devil. Black Wolf and certain ghosts of the unburied are the worst. Everybody has a secret fetish or "medicine," besides such general "lucks" as Swastikas, bear skins, and otter and squirrel tails.

Of the other cult of the peoples I have mentioned, those who worship the sun as the deity and not the habitation, I know nothing. They are secret, suspicious, and gloomy, and do not wear the "luck." I have never seen old people wear the "luck."

Now, I have told you all I know, except that it [the Swastika] used in ancient times to be made in quill embroidery on herb bags.

Miss Owen spoke of other garters with Swastikas on them, but she said they were sacred, were used only during certain ceremonies, and she knew not if she could be able to get or even see them. During the prolongation of the preparation of this paper she wrote two or three times, telling of the promises made to her by the two Sac women who were the owners of these sacred garters, and how each time they

¹This was the last time I ever saw Mr. Dorsey. He died within a month, beloved and regretted by all who knew him.

had failed. Yet she did not give up hope. Accordingly, in the winter of 1896, the little box containing the sacred garters arrived. Miss Owen says the husbands of these two Sac women are Pottawatomies on the Cook County (Kans.) Reservation. They are sun worshippers. These garters have been sketched and figured in pl. 16.

The Pueblos.—The Pueblo country in Colorado, Utah, New Mexico, and Arizona, as is well known, is inhabited by various tribes of Indians speaking different languages, separated from one another and from all other tribes by differences of language, customs, and habit, but somewhat akin to each other in culture, and many things different from other tribes are peculiar to them. These have been called the "Pueblo Indians" because they live in pueblos or towns. Their present country includes the regions of the ancient cliff dwellers, of whom they are supposed to be the descendants. In those manifestations of culture wherein they are peculiar and different from other tribes they have come to be considered something superior. Any search for the Swastika in America which omitted these Indians would be fatally defective, and so here it is found. Without speculating how the knowledge of the Swastika came to them, whether by independent invention or brought from distant lands, it will be enough to show its knowledge among and its use by the peoples of this country.



Fig. 256.

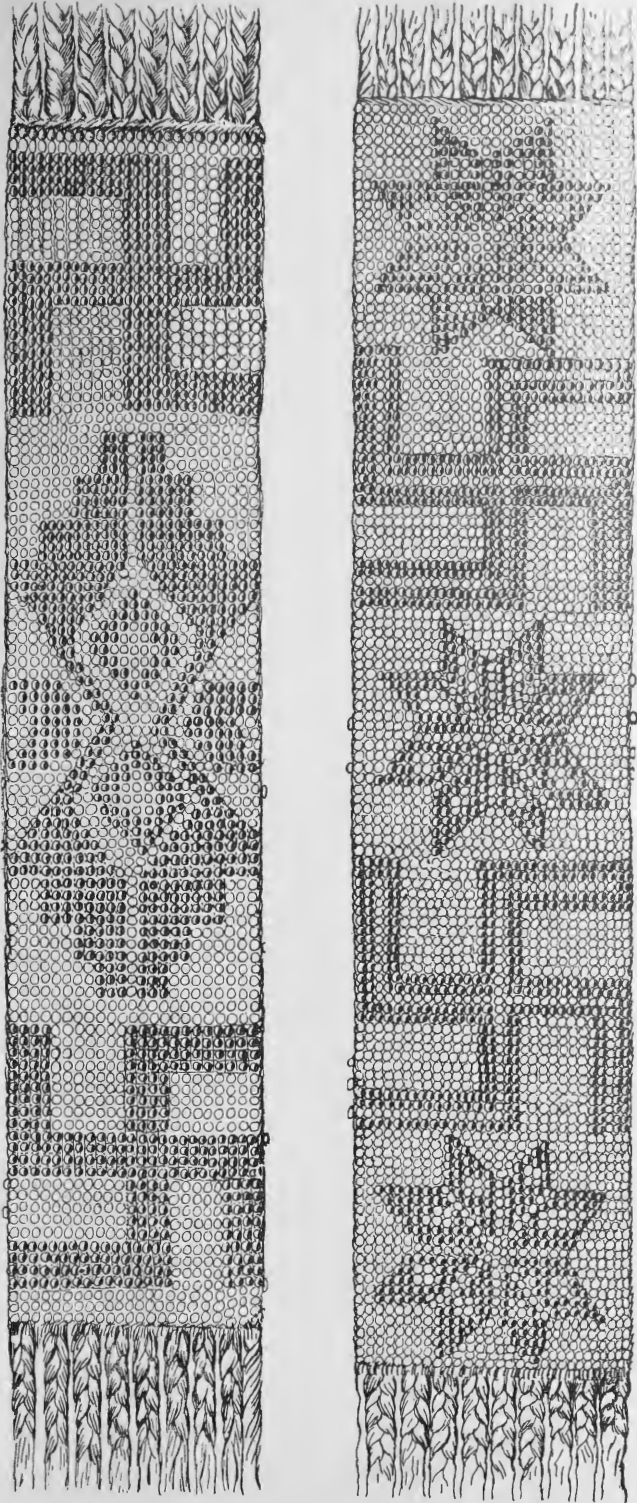
DANCE RATTLE MADE OF A
SMALL GOURD DECORATED
IN BLACK, WHITE, AND RED.

Ogee Swastika on each side.
Second Annual Report of the Bureau
of Ethnology, fig. 526.

Cat. No. 42042, U. S. N. M.

In the Annual Report of the Bureau of Ethnology for the year 1880-81 (p. 394, fig. 562) is described a dance rattle made from a small gourd, ornamented in black, white, and red (fig. 256). The gourd has a Swastika on each side, with the ends bent, not square, but ogee (the tetraskelion). The U. S. National Museum possesses a large number of these dance rattles with Swastikas on their sides, obtained from the Pueblo Indians of New Mexico and Arizona. Some of them have the natural neck for a handle, as shown in the cut; others are without neck, and have a wooden stick inserted and passed through for a handle. Beans, pebbles, or similar objects are inside, and the shaking of the machine makes a rattling noise which marks time for the dance.

The Museum possesses a large series of pottery from the various pueblos of the Southwest; these are of the painted and decorated kind common to that civilization and country. Some of these pieces bear the Swastika mark; occasionally it is found outside, occasionally inside. It is more frequently of the ogee form, similar to that on the rattle from the same country (fig. 256). The larger proportion of these specimens comes from the pueblos of Santa Clara and St. Ildefonso.



CEREMONIAL BEAD GARTERS WITH SWASTIKAS.
Sac Indians, Cook County (Kansas) Reservation.

Dr. Schliemann reports:¹

We also see a Swastika (turned to the left) scratched on two terra-cotta bowls of the Pueblo Indians of New Mexico, preserved in the ethnological section of the Royal Museum at Berlin.

G. Nordenskiöld,² in the report of his excavations among the ruined pueblos of the Mesa Verde, made in southwestern Colorado during the summer of 1891, tells of the finding of numerous specimens of the Swastika. In pl. 23, fig. 1, he represents a large, shallow bowl in the refuse heap at the "Step House." It was 50 centimeters in diameter, of rough execution, gray in color, and different in form and design from other vessels from the cliff houses. The Swastika sign (to the right) was in its center, and made by lines of small dots. His pl. 27, fig. 6, represents a bowl found in a grave (*g* on the plan) at "Step House." Its decoration inside was of the usual type, but the only decoration on the outside consisted of a Swastika, with arms crossing at right angles and ends bent at the right, similar to fig. 9. His pl. 18, fig. 1, represented a large bowl found in Mug House. Its decoration consisted in part of a Swastika similar in form and style to the Etruscan gold "bullæ," fig. 188 in this paper. Certain specimens of pottery from the pueblos of Santa Clara and St. Ildefonso, deposited in the U. S. National Museum (Department of Ethnology), bear Swastika marks, chiefly of the ogee form.³

The Navajoes.—Dr. Washington Matthews, U. S. A., than whom no one has done better, more original, nor more accurate anthropologic work in America, whether historic or prehistoric, has kindly referred me to his memoir in the Fifth Annual Report of the Bureau of Ethnology, comprising 82 pages, with 9 plates and 9 figures, entitled "The Mountain Chant; a Navajo ceremony." It is descriptive of one of a number of ceremonies practiced by the shamans or medicine men of the Navajo Indians, New Mexico. The ceremony is public, although it takes place during the night. It lasts for nine days and is called by the Indians "*dsilyidje qaçàl*"—literally, "chant toward (a place) within the mountains." The word "*dsilyi*" may allude to mountains in general, to the Carrizo Mountains in particular, to the place in the mountains where the prophet (originator of these ceremonies) dwelt, or to his name, or to all of these combined. "*Qaçàl*" means a sacred song or a collection of sacred songs. Dr. Matthews describes at length the myth which is the foundation of this ceremony, which must be read to be appreciated, but may be summarized thus: An Indian family, consisting of father, mother, two sons, and two daughters, dwelt in ancient times near the Carrizo Mountains. They lived by hunting and trapping; but the

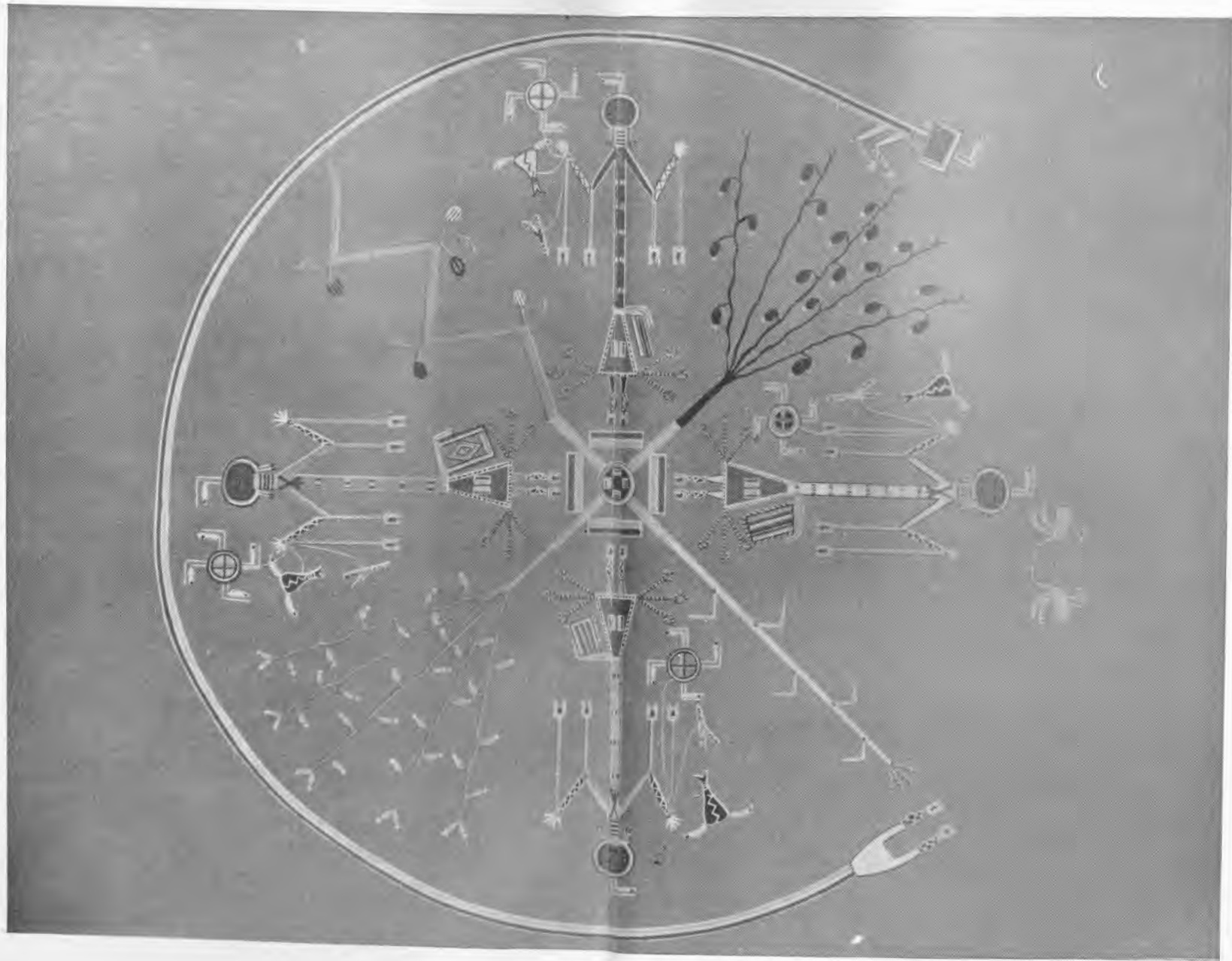
¹"Troja," p. 123.

²"The Cliff Dwellers of the Mesa Verde, Southwestern Colorado," P. A. Norstedt & Son, Chicago, 1893.

³From letter of Mr. Walter Hough, Winslow, Ariz. "I send you two pieces of pottery [bearing many ogee Swastikas] from the ruins near here formerly inhabited by the Moki. Many of the bowls which we have found in this ruin had the Swastika as a major *motif* in the decoration."

See also *The Archæologist*, III, No. 7, p. 248.

place was desert, game scarce, and they moved up the river farther into the mountains. The father made incantations to enable his two sons to capture and kill game; he sent them hunting each day, directing them to go to the east, west, or north, but with the injunction not to the south. The elder son disobeyed this injunction, went to the south, was captured by a war party of Utes and taken to their home far to the south. He escaped by the aid of *Yàybichy* (*Qastcèèlçi*) and divers supernatural beings. His adventures in returning home form the body of the ceremony wherein these adventures are, in some degree, reproduced. Extensive preparations are made for the performance of the ceremony. Lodges are built and corrals made for the use of the performers and the convenience of their audience. The fête being organized, stories are told, speeches made, and sacred songs are sung (the latter are given by Dr. Matthews as "songs of sequence," because they must be sung in a progressive series on four certain days of the ceremony). Mythological charts of dry sand of divers colors are made on the earth within the corrals after the manner of the Navajo and Pueblo Indians. These dry sand paintings are made after a given formula and intended to be repeated from year to year, although no copy is preserved, the artists depending only upon the memory of their shaman. One of these pictures or charts represents the fugitive's escape from the Utes, his captors, down a precipice into a den or cave in which burnt a fire "on which was no wood." Four pebbles lay on the ground together—a black pebble in the east, a blue one in the south, a yellow one in the west, and a white one in the north. From these flames issued. Around the fire lay four bears, colored and placed to correspond with the pebbles. When the strangers (*Qastcèèlçi* and the Navajo) approached the fire the bears asked them for tobacco, and when they replied they had none, the bears became angry and thrice more demanded it. When the Navajo fled from the Ute camp, he had furtively helped himself from one of the four bags of tobacco which the council was using. These, with a pipe, he had tied up in his skin robe; so when the fourth demand was made he filled the pipe and lighted it at the fire. He handed the pipe to the black bear, who, taking but one whiff, passed it to the blue bear and immediately fell senseless. The blue bear took two whiffs and passed the pipe, when he too fell over unconscious. The yellow bear succumbed after the third whiff, and the white bear in the north after the fourth whiff. Now the Navajo knocked the ashes and tobacco out of his pipe and rubbed the latter on the feet, legs, abdomen, chest, shoulders, forehead, and mouth of each of the bears in turn, and they were at once resuscitated. He replaced the pipe in the corner of his robe. When the bears recovered, they assigned to the Navajo a place on the east side of the fire where he might lie all night, and they brought out their stores of corn meal, *teiltcin*, and other berries, offering them to him to eat; but *Qastcèèlçi* warned him not to touch the food, and disappeared. So, hungry as he was, the Indian lay down supperless to sleep. When he awoke in the



NAVAJO DRY PAINTING CONTAINING SWASTIKAS.

Dr. Washington Matthews, "The Mountain Chant: A Navajo Ceremony," Fifth Annual Report of the Bureau of Ethnology, 1883-84, Pl. xvii.

morning, the bears again offered food, which he again declined, saying he was not hungry. Then they showed him how to make the bear *kethàwns*, or sticks, to be sacrificed to the bear gods, and they drew from one corner of the cave a great sheet of cloud, which they unrolled, and on it were painted the forms of the "yays" of the cultivated plants.

In Dr. Matthews's memoir (marked third, but described on p. 447 as the second picture), is a representation of the painting which the prophet was believed to have seen at the home of the bears in the Carrizo Mountains. This is here reproduced as pl. 17. In the center of the figure is a bowl of water covered with black powder; the edge of the bowl is garnished with sunbeams, while outside of it and forming a rectangle are the four *ca'bitlol* of sunbeam rafts on which seem to stand four gods, or "yays," with the plants under their special protection, which are painted the same color as the gods to which they belong. These plants are represented on their left hand, the hand being open and extended toward them. The body of the eastern god is white, so is the stalk of corn at his left in the southeast; the body of the southern god is blue, so is the beanstalk beside him in the southwest; the body of the western god is yellow, so is his pumpkin vine in the northwest; the body of the north god is black, so is the tobacco plant in the northeast. Each of the sacred plants grows from five white roots in the central waters and spreads outward to the periphery of the picture. The figures of the gods form a cross, the arms of which are directed to the four cardinal points; the plants form another cross, having a common center with the first, the arms extending to the intermediate points of the compass. The gods are shaped alike, but colored differently; they lie with their feet to the center and heads extended outward, one to each of the four cardinal points of the compass, the faces look forward, the arms half extended on either side, the hands raised to a level with the shoulders. They wear around their loins skirts of red sunlight adorned with sunbeams. They have ear pendants, bracelets, and armlets, blue and red, representing turquoise and coral, the prehistoric and emblematic jewels of the Navajo Indians. Their forearms and legs are black, showing in each a zigzag mark representing lightning on the black rain clouds. In the north god these colors are, for artistic reasons, reversed. The gods have, respectively, a rattle, a charm, and a basket, each attached to his right hand by strings. This basket, represented by concentric lines with a Greek cross in the center, all of the proper color corresponding with the god to whom each belongs, has extending from each of its quarters, arranged perpendicularly at right angles to each other, in the form of a cross, four white plumes of equal length, which at equal distances from the center are bent, all to the left, and all of the same length. Thus are formed in this chart four specimens of the Swastika, with the cross and circle at the intersection of the arms. The plumes have a small black spot at the tip end of each.

Dr. Matthews informs me that he has no knowledge of any peculiar meaning attributed by these Indians to this Swastika symbol, and we

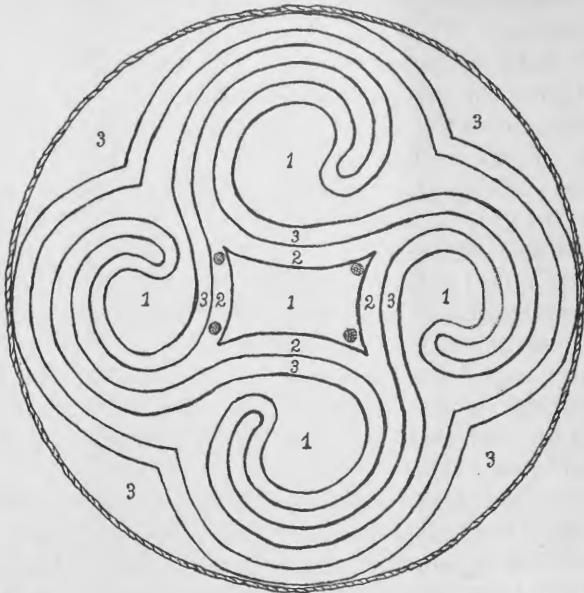


Fig. 257.

WAR SHIELD USED BY THE PIMA INDIANS.

Ogee Swastika (tetraskelion) in three colors: (1) blue, (2) red, (3) white.

Cat. No. 27829, U. S. N. M.

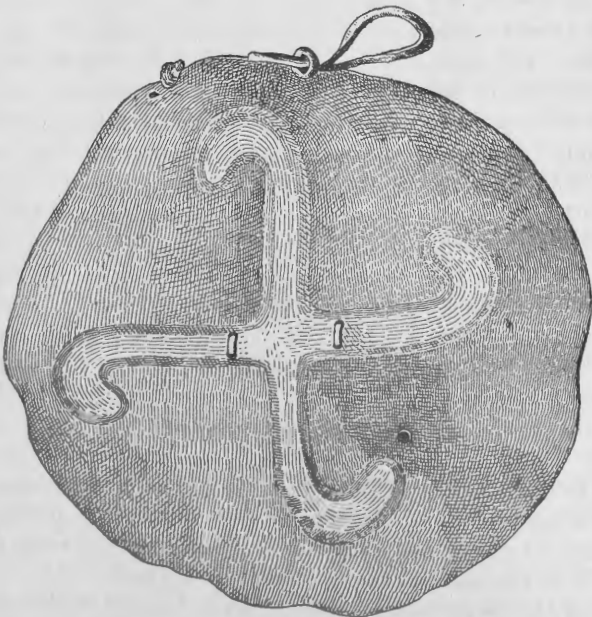


Fig. 258.

WAR SHIELD WITH OGEE SWASTIKA IN CENTER.

Pima Indians.

The hole near the lower arm of the Swastika was made by an arrow.

Property of Mr. F. W. Hodge.

know not whether it is intended as a religious symbol, a charm of blessing, or good luck, or whether it is only an ornament. We do not know whether it has any hidden, mysterious, or symbolic meaning; but there it is, a prehistoric or Oriental Swastika in all its purity and simplicity, appearing in one of the mystic ceremonies of the aborigines in the great American desert in the interior of the North American Continent.

The Pimas.—The U. S. National Museum possesses a shield (Cat. No. 27829) of bull hide, made by the Pima Indians. It is about 20 inches in diameter, and bears upon its face an ogee Swastika (tetraskelion), the ends bent to the right. The body and each arm is divided longitudinally into three stripes or bands indicated by colors, blue, red, and white, arranged alternately. The exterior part of the shield has a white ground, while the interior or center has a blue ground. This shield (fig. 257) is almost an exact reproduction of the Swastika from Mycenæ (fig. 161), from Ireland (fig. 216), and from Scandinavia (figs. 209 and 210). Fig. 258 shows another Pima shield of the same type. Its Swastika is, however, painted with a single color or possibly a mixture of two, red and white. It is ogee, and the ends bend to the left. This shield is the property of Mr. F. W. Hodge, of the Bureau of Ethnology. He obtained it from a Pima Indian in Arizona, who assured him that the hole at the end of the lower arm of the Swastika was made by an arrow shot at him by an Indian enemy.

COLONIAL PATCHWORK.

In Scribner's Magazine for September, 1894, under the title of "Tapestry in the New World," one of our popular writers has described, with many illustrations, the bedquilt patterns of our grandmothers' time. One of these she interprets as the Swastika. This is, however, believed to be forced. The pattern in question is made of patches in the form of rhomboids and right-angled triangles sewed and grouped somewhat in the form of the Swastika (fig. 259). It is an invented combination of patchwork which formed a new pattern, and while it bears a slight resemblance to the Swastika, lacks its essential elements. It was not a symbol, and represents no idea beyond that of a pretty pattern. It stood for nothing sacred, nor for benediction, blessing, nor good luck. It was but an ornamental pattern which fortuitously had the resemblance of Swastika. It was not even in the form of a cross. The difference between it and the Swastika is about the same there would be between the idle and thoughtless boy who sporadically draws the

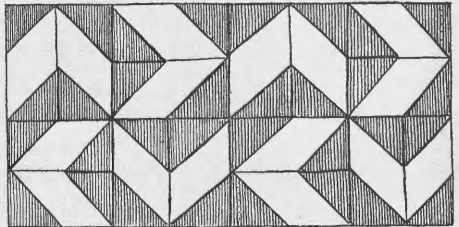


Fig. 259.

COLONIAL PATCHWORK WITH FIGURES RESEMBLING SWASTIKAS.

Scribner's Magazine, September, 1894.

cross on his slate, meaning nothing by it, or at most only to make an ornament, and the devout Christian who makes the same sign on entering the church, or the Indian who thus represents the four winds of heaven. He who made the Swastika recognizes an occult power for good and against evil, and he thereby invokes the power to secure prosperity. She who made the quilt pattern apparently knew nothing of the old-time Swastika, and was not endeavoring to reproduce it or anything like it. She only sought to make such an arrangement of rhomboidal and triangular quilt patches as would produce a new ornamental pattern.

CENTRAL AMERICA.

NICARAGUA.

The specimen shown in fig. 260 (Cat. No. 23726, U.S.N.M.) is a fragment, the foot of a large stone metate from Zapatero, Granada, Nicaragua. The metate was chiseled or pecked out of the solid. A sunken panel is surrounded by moldings, in the center of which appears, from its outline, also by raised moldings, a figure, the outline of which is a Greek cross, but whose exterior is a Swastika. Its form as such is perfect, except that one bent arm is separated from its stem by a shallow groove.



Fig. 260.

FRAGMENT OF THE FOOT OF A STONE METATE WITH
FIGURE OF SWASTIKA.

Nicaragua.

Cat. No. 23726, U. S. N. M.

"The Cross, Ancient and Modern," by W. W. Blake, shows, in its fig. 57, a Swastika pure and simple, and is cited by its author as representing a cross found by Squier in Central America. The Mexican enthusiast, Orozco y Perra, claims at first glance that it shows Buddhist origin, but I have not been able as yet to verify the quotation.

YUCATAN.

Dr. Schliemann reports, in the Ethnological Museum at Berlin, a pottery bowl from Yucatan ornamented with a Swastika, the two main arms crossing at right angles, and he adds,¹ citing Le Plongeon, "Fouilles au Yucatan," that "during the last excavations in Yucatan this sign was found several times on ancient pottery."

Le Plongeon discovered a fragment of a stone slab in the ancient Maya city of Mayapan, of which he published a description in the Pro-

¹ "Troja," p. 122.

ceedings of the American Antiquarian Society. It contains an ogee Swastika (tetraskelion), with ends curved to the left and an inverted U with a wheel (fig. 261). Le Plongeon believed it to be an Egyptian inscription, which he translated thus: The character, inverted U, stood for *Ch* or *K*; the wheel for the sun, *Aa* or *Ra*, and the Swastika for *Ch* or *K*, making the whole to be *Chach* or *Kak*, which, he says, is the word *fire* in the Maya language.¹

COSTA RICA.

A fragment of a metate (Cat. No. 9693, U. S. N. M.) found on Lempa River, Costa Rica, by Capt. J. M. Dow, has on its bottom a Swastika similar to that on the metate from Nicaragua. Specimen No. 59182, U. S. M. N., is a fragment of a pottery vase from Las Huacas, Costa Rica, collected by Dr. J. F. Bransford. It is natural maroon body color, decorated with black paint. A band two inches wide is around the belly of the vase divided into panels of solid black alternated with fanciful geometric figures, crosses, circles, etc. One of these panels contains a partial Swastika figure. The two main arms cross at right angles in Greek form. It is a partial Swastika in that, while the two perpendicular arms bend at right angles, turning six times to the right; the two horizontal arms are solid black in color, as though the lines and spaces had run together.

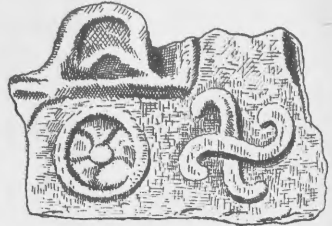


Fig. 261.

FRAGMENT OF STONE SLAB FROM THE ANCIENT MAYA CITY OF MAYAPAN.

Ogee Swastika (tetraskelion).

Proceedings of the American Antiquarian Society, April 21, 1881.

SOUTH AMERICA.

BRAZIL.

The leaden idol (fig. 125) (*Artemis Nana*² of Chaldea, Sayce; statuettes of the Cyclades, Lenormant) found by Dr. Schliemann in the third, the burnt city of Hissarlik, Troy, was described (p. 829) with its Swastika on the triangular shield covering the pudendum, with the statement that it would be recalled in the chapter on Brazil.

The aboriginal women of Brazil wore a triangular shield or plaque over their private parts. These shields are made of terra cotta, quite thin, the edges rounded, and the whole piece rubbed smooth and polished. It is supported in place by cords around the body, which are attached by small holes in each angle of the triangle. The U. S. National Museum possesses several of these plaques from Brazil, and several were shown at the Chicago Exposition.

¹The presence of the Swastika is the only purpose of this citation. The correctness of the translation is not involved and is not vouched for.

²Equivalent to Istar of Assyria and Babylon, Astarte of Phenicia, to the Greek Aphrodite, and the Roman Venus.

The consideration of the leaden idol of Hissarlik, with a Swastika, as though for good luck, recalled to the author similar plaques in his department from Brazil. Some are of common yellow ware, others were finer, were colored red and rubbed smooth and hard, but were without decoration. The specimen shown in pl. 18 (upper figure) was from Marajo, Brazil, collected by Mr. E. M. Brigham. It is of light gray, slip washed, and decorated with pale red or yellow paint in bands, lines, parallels, geometric figures. The specimen shown in the lower figure of the same plate, from the Caneotires River, Brazil, was collected by Prof. J. B. Steere. The body color, clay, and the decoration paint are much the same as the former. The ornamentation is principally by two light lines laid parallel and close so as to form a single line, and is of the same geometric character as the incised decoration ornament on other pieces from Marajo Island. Midway from top to bottom, near the outside edges, are two Swastikas. They are about five-eighths of an inch in size, are turned at right angles, one to the right and the other to the left. These may have been a charm signifying good fortune in bearing children. (See pp. 830-832.)

These specimens were submitted by the author to the Brazilian minister, Señor Mendonça, himself an archæologist and philologist of no small capacity, who recognized these objects as in use in ancient times among the aborigines of his country. The name by which they are known in the aboriginal language is *Tambeao* or *Tamatiatang*, according to the dialects of different provinces. The later dialect name for apron is reported as *tunga*, and the minister makes two remarks having a possible bearing on the migration of the race: (1) The similarity of *tunga* with the last syllable of the longer word, *atang*, and (2) that *tunga* is essentially an African word from the west coast. Whether this piece of dress so thoroughly savage, with a possible ceremonial meaning relating to sex or condition, with its wonderful similarity of names, might not have migrated in time of antiquity from the west coast of Africa to the promontory of Brazil on the east coast of America where the passage is narrowest, is one of those conundrums which the prehistoric anthropologist is constantly encountering and which he is usually unable to solve.

The purpose of these objects, beyond covering the private parts of the female sex, is not known. They may have been ceremonial, relating, under certain circumstances, to particular conditions of the sex, or they may have been only variations of the somewhat similar covers used by the male aborigine. They bear some resemblance to the *Ceintures de Chasteté*, specimens of which are privately shown at the Musée de Cluny at Paris. These are said to have been invented by Françoise de Carara, vignier imperial (provost) of Padua, Italy, near the end of the fourteenth century. He applied it to all the women of his seraglio. He was beheaded A. D. 1405, by a decree of the Senate of Venice, for his many acts of cruelty. The palace of St. Mark contained for a long time a box or case of these ceintures with their locks

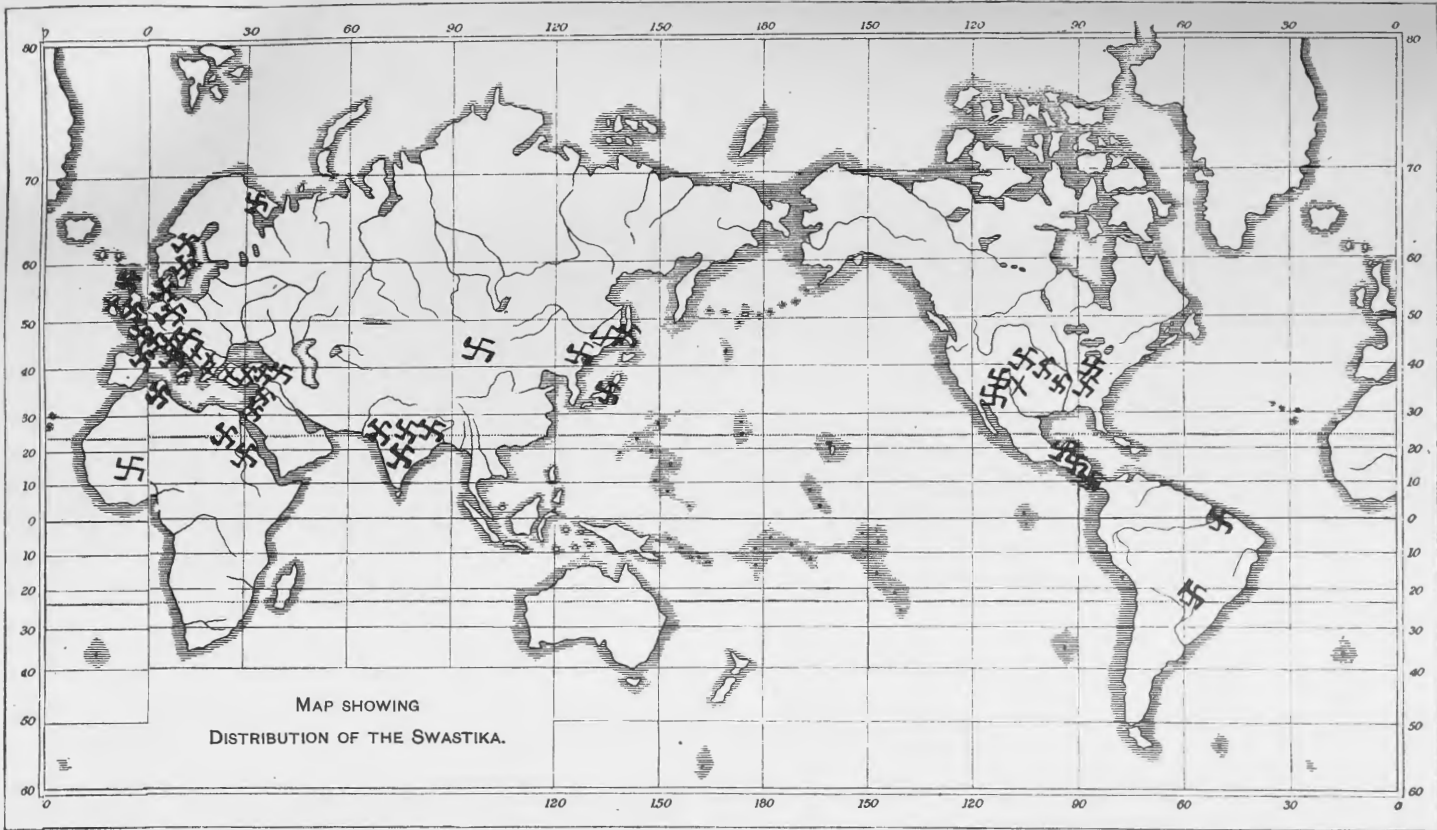


FOLIUM VITUS ("FIG LEAVES").

Terra-cotta covers, "tunga."

Aborigines of Brazil.

Cat. Nos. 59089 and 36542, U. S. N. M.



attached, which were represented as *des pieces de conviction* of this monster.¹ Voltaire describes his hero "*qui tient sous la clef, la vertu de sa femme.*"

PARAGUAY.

Dr. Schliemann reports that a traveler of the Berlin Ethnological Museum obtained a pumpkin bottle from the tribe of Lenguas in Paraguay which bore the imprint of the Swastika scratched upon its surface, and that he had recently sent it to the Royal Museum at Berlin.

III.—FORMS ALLIED TO THE SWASTIKA.

MEANDERS, OGEES, AND SPIRALS, BENT TO THE LEFT AS WELL AS TO THE RIGHT.

There are certain forms related to the normal Swastika and greatly resembling it—meanders, ogees, the triskelion, tetraskelion, and five and six armed spirals or volutes. This has been mentioned above (page 768), and some of the varieties are shown in fig. 13. These related forms have been found in considerable numbers in America, and this investigation would be incomplete if they were omitted. It has been argued (p. 839) that the Swastika was not evolved from the meander, and this need not be reargued.

The cross with the arms bent or twisted in a spiral is one of these related forms. It is certain that in ancient, if not prehistoric, times the cross with extended spiral arms was frequently employed. This form appeared in intimate association with the square Swastikas which were turned indifferently to the right and left. This association of different yet related forms was so inti-

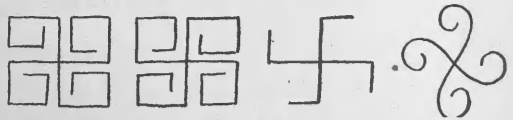


Fig. 262.

DIFFERENT FORMS OF SWASTIKA FOR COMPARISON.

mate, and they were used so indiscriminately as to justify the contention that the maker or designer recognized or admitted no perceptible or substantial difference between the square and spiral forms, whether they turned to the right or left, or whether they made a single or many turns, and that he classed them as the same sign or its equivalent. A Greek vase (fig. 174) shows five Swastikas, four of which are of different form (fig. 262). Curiously enough, the design of this Greek vase is painted maroon on a yellow ground, the style generally adopted in the vases from the mounds of Missouri and Arkansas, which mostly represent the spiral Swastika.

In Ireland a standing stone (fig. 215) has two forms of Swastika side by side. In one the arms are bent square at the corners, the other has curved or spiral arms, both turned to the right. These examples are so numerous that they would seem convincing in the absence of any other evidence (figs. 166 to 176).

¹Cited in "Misson Voyage d'Italie," tome 1, p. 217; Dulaure, "Histoire des Diferens Cultes," II; Brant6ne, "Dames Galantes"; Rabelais, "Pantagruel," 3, chap. 35.

ABORIGINAL AMERICAN ENGRAVINGS AND PAINTINGS.

These allied forms of Swastika appear on prehistoric objects from mounds and Indian graves in different parts of the country and in times of high antiquity as well as among modern tribes. This paper contains the results of the investigations in this direction.

DESIGNS ON SHELL.

The Department of Prehistoric Anthropology in the U. S. National Museum, contains a considerable number of large shells of aboriginal



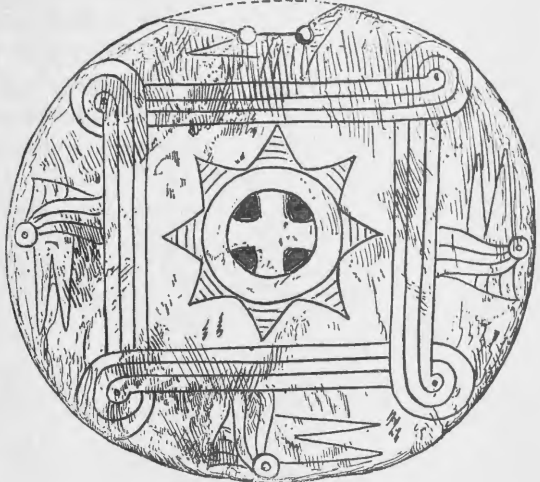
Fig. 263.

SHELL GORGET.

Cross, circle, sun's rays (?), and heads of four ivory-billed woodpeckers (?) arranged to form a Swastika.
Mississippi.

workmanship. The shell most employed was that of the genus *Fulgur*, a marine shell found on the coast from Florida to the capes. The *Unio* was employed, as well as others. These marine shells were transported long distances inland. They have been found in mounds and Indian

graves a thousand miles from their original habitat. They served as utensils as well as ornaments. In many specimens the whorl was cut out, the shells otherwise left entire, and they served as vessels for holding or carrying liquids. When intended for ornaments, they were cut into the desired form and engraved with the design; if to be used as gorgets, holes were drilled for suspension. Frequently they were smoothed on the outside and the design engraved thereon. The preference of the aborigines for the *Fulgur* shell may have been by reason of its larger size. Among the patterns employed for the decoration of these shells, the Swastika, in the form of spirals, volutes, or otherwise, appeared, although many others, such as the rattlesnake, birds, spiders, and human masks were employed.



Figs. 264.

SHELL GORGET FROM TENNESSEE.

Square figure with ornamental corners and heads of ivory-billed woodpecker arranged to form a figure resembling the Swastika.



Fig. 265.

SHELL GORGET FROM TENNESSEE.

Square figure with ornamental corners and heads of ivory-billed woodpecker arranged to form a figure resembling the Swastika.

No detailed description of the patterns of this shellwork will be attempted, because figures will be required to give the needed information for the interpretation of the Swastika. Many of the cuts and some of the descriptions are taken from the annual reports of the Bureau of Ethnology and, so far as relates to shell, mostly from Mr. Holmes's paper on "Art in Shell of the Ancient Americans." I desire to express my thanks for all cuts obtained from the Bureau publications.

Ivory-billed woodpecker.—A series of gorgets in shell have been found ornamented with designs resembling the Swastika, which should be noticed. They combine

the square and the cross, while the head and bill of the bird form the *gamma* indicative of the Swastika. Fig. 263, taken from the Second Annual Report of the Bureau of Ethnology, 1880-81 (pl. 58), shows one of these shell gorgets from Mississippi, which "was, in all probability, obtained from one of the multitude of ancient sepulchres that abound in the State of Mississippi." The design is engraved on the convex side, the perforations are placed near the margin, and show much wear by the cord of suspension. In the center is a nearly symmetrical Greek cross inclosed in a circle of $1\frac{1}{2}$ inches. The spaces between the arms are emblazoned with radiating lines. Outside this circle are twelve small pointed or pyramidal rays. A square framework of four continuous parallel lines looped at the corners incloses this symbol; projecting from the center of each side of this square, opposite the arms of the cross, are four heads of birds representing the ivory-billed woodpecker, the heron, or the swan. The long, slender, and straight mandibles give the Swastika form to the object. Mr. Holmes says (p. 282) that he has been able to find six of these specimens, all of the type described, varying only in detail, workmanship, and finish.

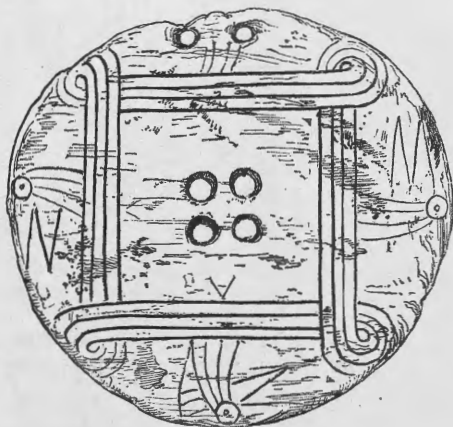


Fig. 266.

SHELL GORGET FROM TENNESSEE.

Square figure with ornamental corners and heads of ivory-billed woodpecker arranged to form a figure resembling the Swastika.

It is about $2\frac{1}{2}$ inches in diameter and, like the former, it has a Greek cross in the center. The second was obtained by Mr. Cross from a stone grave near Nashville, Tenn. The third is from a stone grave near Oldtown, Tenn. All these have been drilled for suspension and are much worn.

The triskele, triskelion, or triquetrum.—These are Greek and Latin terms for the spiral volute with three branches or arms. The coins of Lycia were in this form, made originally by the junction of three cocks' heads and necks. The armorial bearings of the island of Sicily, in ancient times, consisted of three human legs joined at the thigh and flexed, sometimes booted and spurred (p. 873).

Aboriginal shell gorgets have been found in the mounds of Tennessee and the adjoining country, which were engraved with this design, though always in spiral form. There seems to have been no distinction

¹ Second Ann. Rep. Bureau of Ethnology, p. 59.

in the direction of the volutes, they turning indifferently to the right or to the left. Because of their possible relation to the Swastika it has been deemed proper to introduce them.

Fig. 267¹ shows a *Fulgur* shell specimen obtained by Major Powell from a mound near Nashville, Tenn. It was found near the head of a skeleton. Its substance is well preserved; the surface was once highly polished, but now is pitted by erosion and discolored by age. The design is engraved on the concave surface as usual, and the lines are



Fig. 267.

SCALLOPED SHELL DISK (FULGUR) FROM A MOUND NEAR NASHVILLE, TENN.

Three spiral volutes (triskelion).

accurately drawn and clearly cut. The central circle is three-eighths of an inch in diameter and is surrounded by a zone one-half an inch in width, which contains a triskelion or triquetrum of three voluted lines beginning near the center of the shell on the circumference of the inner circle of three small equidistant perforations, and sweeping outward spirally to the left as shown in the figure, making upward of half a revolution. These lines are somewhat wider and more deeply engraved than

¹ Second Ann. Rep. Bureau of Ethnology, 1880-81, p. 273, pl. 54.

the other lines of the design. In some specimens they are so deeply cut as to penetrate the disk, producing crescent-shaped perforations. Two medium-sized perforations for suspension have been made near the inner margin of one of the bosses next the dotted zone; these show abrasion by the cord of suspension. These perforations, as well as the three near the center, have been bored mainly from the convex side of the disk.

Fig. 268¹ represents a well-preserved disk with four volute arms forming the tetraskelion, and thus allied to the Swastika. The volutes (to



Fig. 268.

SCALLOPED SHELL DISK FROM A MOUND NEAR NASHVILLE TENN.

Circles and dots and four spiral volutes (tetraskelion).

the right) are deeply cut and for about one-third their length penetrate the shell, producing four crescent-shaped perforations which show on the opposite side. This specimen is from a stone grave near Nashville, Tenn., and the original is in the Peabody Museum. Fig. 269² shows a specimen from the Brakebill mound, near Knoxville, Tenn. It has a dot in the center, with a circle five-eighths of an inch in diameter. There are four volute arms which start from the opposite sides of

¹ Second Ann. Rep. Bureau of Ethnology, 1880-81, pl. 55, fig. 1.

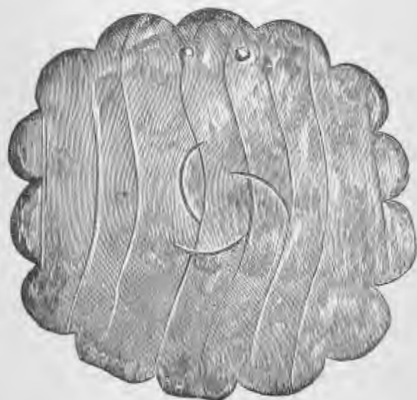
Ibid. pl. 57, fig. 2.



Fig. 269.

SHELL DISK FROM BRAKEBILL MOUND, NEAR KNOXVILLE, TENN.

Dot and circle in center and ogee Swastika (tetraskelion) marked but not completed.



Figs. 270 and 271.

ENGRAVED SHELL DISK.

Obverse and reverse.

Three-armed volute (triskelion).

this circle, and in their spiral form extend to the right across the field, increasing in size as they approach the periphery. This is an interesting specimen of the tetraskelion or spiral Swastika, in that it is unfinished, the outline having been cut in the shell sufficient to indicate the form, but not perfected. Figs. 270 and 271 show obverse and reverse sides of the same shell. It comes from one of the stone graves of Tennessee, and is thus described by Dr. Joseph Jones, of New Orleans,¹ as a specimen of the deposit and original condition of these objects:

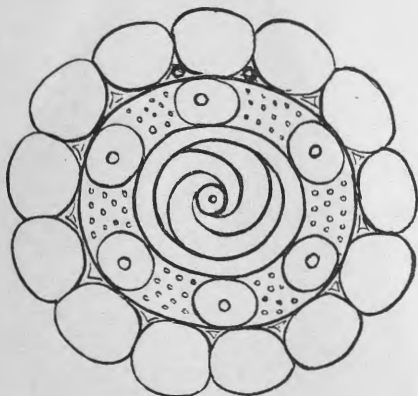


Fig. 272.

ENGRAVED SHELL DISK.

Tennessee.

Three-armed volute (triskelion).

a small circle in the center and four concentric bands, differently figured, in relief. The first band is filled up by a triple volute; the second is plain, while the third is dotted and has nine small round bosses carved at unequal distances upon it. The outer band is made up of fourteen small elliptical bosses, the outer edges of which give to the object a scalloped rim. This ornament, on its concave figured surface, has been covered with red paint, much of which is still visible. The convex smooth surface is highly polished and plain, with the exception of the three concentric marks. The material out of which it is formed was evidently derived from a large flat seashell. * * * The form of the circles or "suns" carved upon the concave surface is similar to that of the paintings on the high rocky cliffs on the banks of the Cumberland and Harpeth rivers. * * * This ornament when found lay upon the breastbone with the concave surface uppermost, as if it had been worn in this position suspended around the neck, as the two holes for the thong or string were in that portion of the border which pointed directly to the chin or central portion of the jaw of the skeleton. The marks of the thong by which it was suspended are manifest upon both the anterior and posterior surfaces, and, in addition to this, the paint is worn off from the circular space bounded below by the two holes.

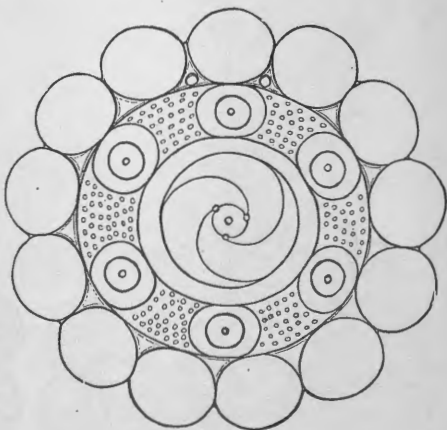


Fig. 273.

ENGRAVED SHELL DISK.

Tennessee.

Three-armed volute (triskelion).

¹Second Ann. Rep. Bureau of Ethnology, 1880-81, p. 276, pl. 56, figs. 1, 2.

Fig. 271 represents the back or convex side of the disk shown in fig. 270. The long curved lines indicate the laminations of the shell, and the three crescent-shaped figures near the center are perforations

resulting from the deep engraving of the three lines of the volute on the concave side. The stone grave in which this ornament was found occupied the summit of a mound on the banks of the Cumberland River, opposite Nashville, Tenn.

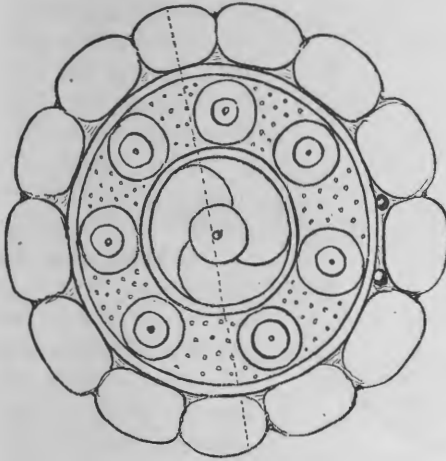


Fig. 274.

ENGRAVED SHELL DISK.

Tennessee.

Three-armed volute (triskelion).

Figs. 272, 273, and 274 are other representations of shell carved in spirals, and may have greater or less relation to the Swastika.¹ They are inserted for comparison and without any expression of opinion. They are drawn in outline, and the spiral form is thus more easily seen.

Mr. Holmes² makes some observations upon these designs

and gives his theory concerning their use:

I do not assume to interpret these designs; they are not to be interpreted. All I desire is to elevate these works from the category of trinkets to what I believe is their rightful place—the serious art of a people with great capacity for loftier works. What the gorgets themselves were, or of what particular value to their possessor, aside from simple ornaments, must be, in a measure, a matter of conjecture. They were hardly less than the totems of clans, the insignia of rulers, or the potent charms of the priesthood.

The spider.—The spider was represented on the shell gorgets. Figs. 275 to 278³ present four of these gorgets, of which figs. 275 to 277 display the Greek cross in the center, surrounded by two concentric incised lines forming a circle which is the body of a spider. Fig. 276 shows the same spider and circle, and inside of it a cross much resem-



Fig. 275.

ENGRAVED SHELL GORGET.

Figure representing a spider; circles and Greek crosses.

¹ Op. cit., p. 276, pl. 56, figs. 3, 5, 6.

² Op. cit., p. 281.

³ Second Ann. Rep. Bureau of Ethnology, 1880-81, pl. 61.

bling the Swastika, in that the arms are turned at their extremities to the right and form, in an inchoate manner, the gamma. Fig. 278 represents the shell with the spider, and, though it contains no cross nor semblance of the Swastika, derives its value from having been taken from the same mound on Fains Island, Tennessee, as was the true Swastika. (See fig. 237.)

The rattlesnake.—The rattlesnake was a favorite design on these gorgets, affording, as it did, an opportunity for the aborigines to make a display of elegance of design, and of accuracy and fineness in execution. Fig. 279 is a specimen in which the snake is represented coiled, the head in the center, the mouth V-shaped in strong lines, the body in volute fashion; on the outside of the circle the tail is shown by its rattle. This specimen is represented three-fourths size, and comes from McMahon mound, Tennessee. Four others of similar design are also from Tennessee and the adjoining States, but the locality is more restricted than is the case with other shell disk ornaments.

The human face and form.—These were also carved and wrought upon shells in the same general locality. The engraving is always on the convex side of the shell which has been reduced to a pear-shaped form.¹



Fig. 276.

ENGRAVED SHELL GORGET.



Fig. 277.

ENGRAVED SHELL GORGET.

¹Second Ann. Rep. Bureau of Ethnology, pls. 69-73.

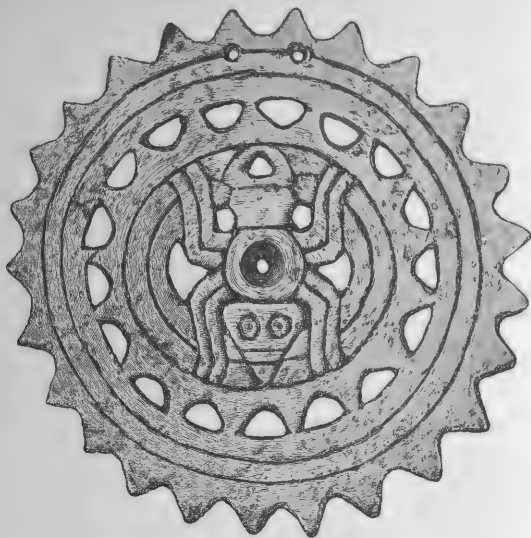


Fig. 278.

ENGRAVED SHELL GORGET.
Fains Island, Tennessee.



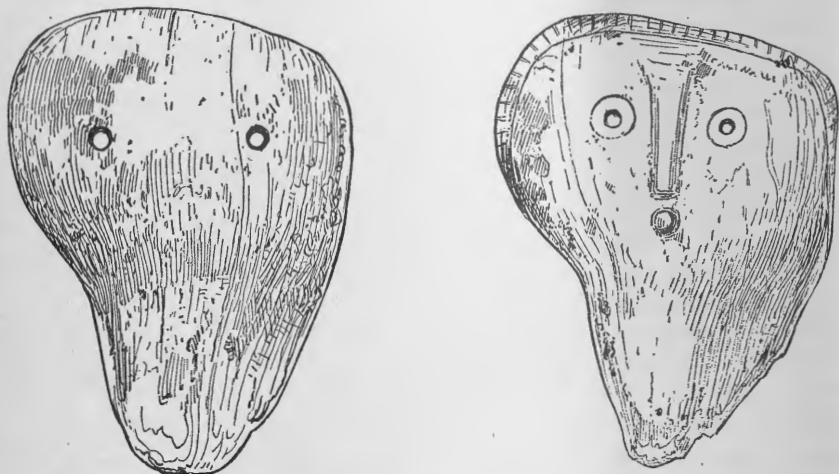
Fig. 279.

ENGRAVED SHELL GORGET REPRESENTING A RATTLESNAKE.

McMahon Mound, Tennessee.

Second Annual Report of the Bureau of Ethnology, pl. LXIII.

These human faces and forms (figs. 280-288), as well as the others, belong to the mound builders, and are found with their remains in the mounds. The figures are inserted, as is the rattlesnake, for compari-

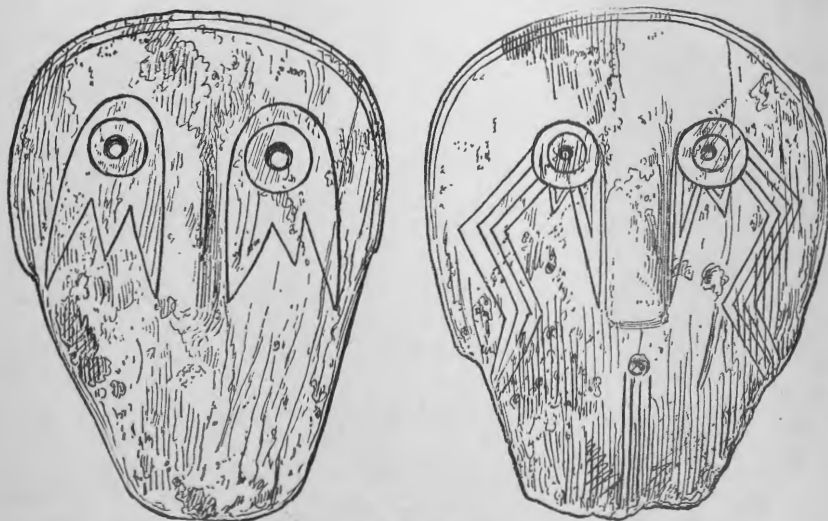


Figs. 280 and 281.

ENGRAVED SHELLS WITH REPRESENTATIONS OF THE HUMAN FACE.

McMahon Mound, Tennessee.

Second Annual Report of the Bureau of Ethnology, pl. LXIX.



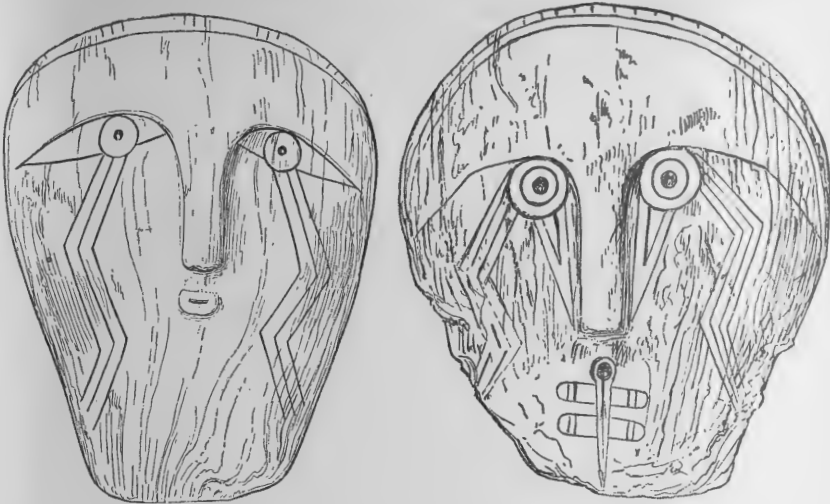
Figs. 282 and 283.

ENGRAVED SHELLS WITH REPRESENTATIONS OF THE HUMAN FACE.

Tennessee.

Second Annual Report of the Bureau of Ethnology, pl. LXIX.

son with the shell designs and work shown in the Buddha figure (pl. 10) and its associates. Slight inspection will show two styles, differing materially. To decide which was foreign and which domestic,



Figs. 284 and 285.

ENGRAVED SHELLS WITH REPRESENTATIONS OF THE HUMAN FACE.
Virginia

Second Annual Report of the Bureau of Ethnology, pl. LXXIX.



Fig. 286.

ENGRAVED SHELL WITH REPRESENTATION OF A HUMAN FIGURE
McMahon Mound, Tennessee.

Second Annual Report of the Bureau of Ethnology, pl. LXXI.

which was imported and which indigenous, would be to decide the entire question of migration, and if done off-hand, would be presumptuous. To make a satisfactory decision will require a marshaling and consideration of evidence which belongs to the future. The specimens shown



Fig. 287.

ENGRAVED SHELL WITH REPRESENTATION OF A HUMAN FIGURE.

Tennessee.

Second Annual Report of the Bureau of Ethnology, pl. LXXII.

in figs. 280 to 285 are from Tennessee and Virginia. They are all masks, bearing representations of the human face. The first two are from the McMahon mound, Tennessee; that in fig. 282 from Brakebill mound, Tennessee, and that represented in fig. 283 from Lick Creek mound, Tennessee. The shell shown in fig. 284 is from Aquia Creek, Virginia,

and that in fig. 285 is from a mound in Ely County, Va. The workmanship on these has no resemblance to that on the Buddha figure (pl. 10), nor does its style compare in any manner therewith.

On the contrary, figs. 286 to 288, representing sketches (unfinished) of the human figure, from mounds in Tennessee and Missouri, have some resemblance in style of work, though not in design, to that of the Buddha and Swastika figures. The first step in execution, after the drawing by incised lines, seems to have been to drill holes through



Fig. 288.

ENGRAVED SHELL GORGET WITH REPRESENTATION OF A HUMAN FIGURE.

Missouri.

Second Annual Report of the Bureau of Ethnology, pl. LXXIII.

the shell at each corner and intersection. The work on the specimen shown in fig. 286 has progressed further than that on the specimens shown in figs. 287 and 288. It has twenty-eight holes drilled, all at corners or intersections. This is similar to the procedure in the Buddha statue (pl. 10). In fig. 287 the holes have not been drilled, but each member of the figure has been marked out and indicated by dots in the center, and circles or half circles incised around them in precisely the same manner as in both Swastikas (figs. 237 and 238), while fig. 288 continues the resemblance in style of drawing. It has the same peculiar

garters or bracelets as the Buddha, the hand is the same as in the fighting figures (fig. 239), and the implement he holds resembles closely those in the copper figures (figs. 240 and 241).

DESIGNS ON POTTERY.

Spiral-volute designs resembling the Swastika in general effect are found on aboriginal mound pottery from the Mississippi Valley. The Fourth Annual Report of the Bureau of Ethnology, 1882-83,¹ shows



Fig. 289.

POTTERY VESSEL.

Four-armed volute, ogee Swastika (tetraskelion).

Arkansas.

$\frac{1}{2}$ natural size.



Fig. 290.

POTTERY VESSEL.

Four volutes resembling Swastika.

Pecan Point, Ark.

$\frac{1}{2}$ natural size.

many of these. Fig. 289 represents a teapot-shaped vessel from Arkansas, on the side of which, in incised lines, is shown the small circle which we saw on the shell disks, and springing from the four opposite sides are three incised lines, twisting spirally to the right, forming the four volutes of the Swastika (tetraskelion) and covering the entire side of the vessel. The same spiral form of the Swastika is given in fig. 290, a vessel of eccentric shape from Pecan Point, Ark.



Fig. 201.

POTTERY VESSEL MADE IN THE FORM OF AN ANIMAL.

Spiral volutes, nine arms.

Pecan Point, Ark.

$\frac{1}{2}$ natural size.

right, forming volutes, the incised lines of which, though drawn close

¹ Figs. 402, 413, 415, 416.

together and at equal distances, gradually expand until the ornament covers the entire side of the vase. It is questionable whether this or any of its kindred were ever intended to represent either the Swastika or any other specific form of the cross. One evidence of this is that these ornaments shade off indefinitely until they arrive at a form which was surely not intended to represent any form of the cross, whether Swastika or not. The line of separation is not now suggested by the author. An elaboration of the preceding forms, both of the vessel and its ornamentation, is shown by the vessel represented in fig. 291, which is fashioned to represent some grotesque beast with horns, expanding nostrils, and grinning mouth, yet which might serve as a teapot as well as the former two vessels.

The decoration upon its side has six incised lines crossing each other in the center and expanding in volutes until they cover the entire side of the vessel, as in the other specimens. Fig. 292 shows a pot from



Fig. 292.

POTTERY BOWL ORNAMENTED WITH
MANY-ARMED VOLUTES.

Arkansas.

$\frac{1}{2}$ natural size.

Arkansas. Its body is decorated with incised lines arranged in much the same form as fig. 291, except that the lines make no attempt to form a cross. There are nine arms which spring from the central point and twist spirally about as volutes until they cover the field, which is one-third the body of the bowl. Two other designs of the same kind complete the circuit of the pot and form the decoration all around. Fig. 293¹ represents these volutes in incised lines of considerable fineness, close together, and in great



Fig. 293.

POTTERY VASE ORNAMENTED WITH VOLUTES.

Arkansas.

numbers, forming a decoration on each of the sides of the vase, separated by three nearly perpendicular lines.

¹ Third Ann. Rep. Bureau of Ethnology, fig. 157.

The spiral Swastika form appears painted upon the pottery from Arkansas. The specimen shown in fig. 294¹ is a tripod bottle. The decoration upon the side of the body consists of two lines forming the cross, and the four arms expand in volutes until the ornament covers one-third of the vessel, which, with the other two similar ornaments, extend around the circumference. This decoration is painted in red and white colors on a gray or yellowish ground. Fig. 295 shows a bowl from mound No. 2, Thorn's farm, Taylor Shanty group, Mark Tree,



Fig. 294.

TRIPOD POTTERY VASE.

Four-armed volutes making spiral Swastika.

Arkansas.

 $\frac{1}{3}$ natural size.

Poinsett County, Ark. It is ten inches wide and six inches high. The clay of which it is made forms the body color—light gray. It has been painted red or maroon on the outside without any decoration, while on the inside is painted with the same color a five-armed cross, spirally arranged in volutes turning to the right. The center of the cross is at the bottom of the bowl, and the painted spiral lines extend over the bottom and up the sides to the rim of the bowl, the interior being

entirely covered with the design. Another example of the same style of decoration is seen on the upper surface of an ancient vase from the province of Cibola.¹

The specimen shown in fig. 296 is from the mound at Arkansas Post, in the county and State of Arkansas.² It represents a vase of black ware, painted a yellowish ground, with a red spiral scroll. Its diam-



Fig. 295.

POTTERY BOWL WITH FIVE-ARMED SPIRAL SWASTIKA ON THE BOTTOM.

Poinsett County, Ark.

Cat. No. 114085, U. S. N. M.

eter is $5\frac{1}{2}$ inches. These spiral figures are not uncommon in the localities heretofore indicated as showing the normal Swastika. Figs. 297 and 298³ show parallel incised lines of the same style as those

¹ Fourth Ann. Rep. Bureau of Ethnology, 1882-83, p. 343, fig. 331.

² Third Ann. Rep. Bureau of Ethnology, 1881-82, fig. 165.

³ Ibid., pp. 502, 503, figs. 186, 189.

forming the square in the bird gorgets already noted (figs. 263-267).

Fig. 297 shows a bowl nine inches in diameter; its rim is ornamented with the head and tail of a conventional bird, which probably served as handles. On the outside, just below the rim, are the four incised parallel lines mentioned. In the center of the side is represented a rolling under or twisting of the lines, as though it represented a ribbon. There are three on each quarter of the bowl, that next the head being plain. Fig. 298 represents a bottle $6\frac{1}{2}$ inches in diameter, with parallel incised lines, three in number, with the same twisting or folding of the ribbon-like decoration. This twists to the left, while that of fig. 297 twists in the opposite direction. Both specimens are from the vicinity of Charleston, Mo.



Fig. 296.

VESSEL OF BLACK WARR.
Spiral scroll.
Arkansas.

DESIGNS ON BASKETRY.

The volute form is particularly adapted to the decoration of basketry, of which fig. 299 is a

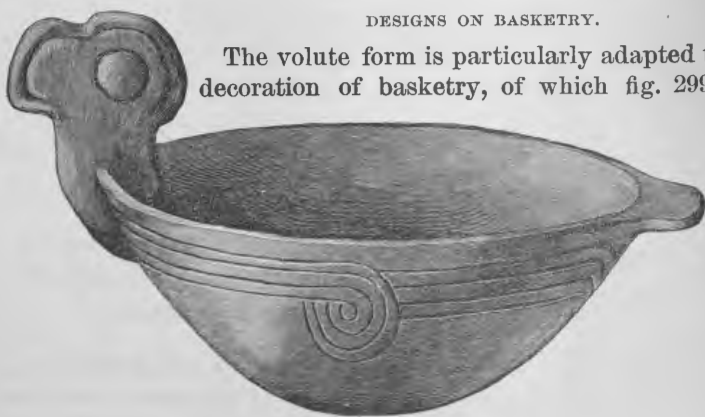


Fig. 297.

BIRD-SHAPED POTTERY BOWL.
Three parallel incised lines with ribbon fold.
Charleston, Mo.

specimen. These motifs were favorites with the Pueblo Indians of New Mexico and Arizona.



Fig. 298.

POTTERY BOWL.

Three parallel incised lines with ribbon fold.

Charleston, Mo.

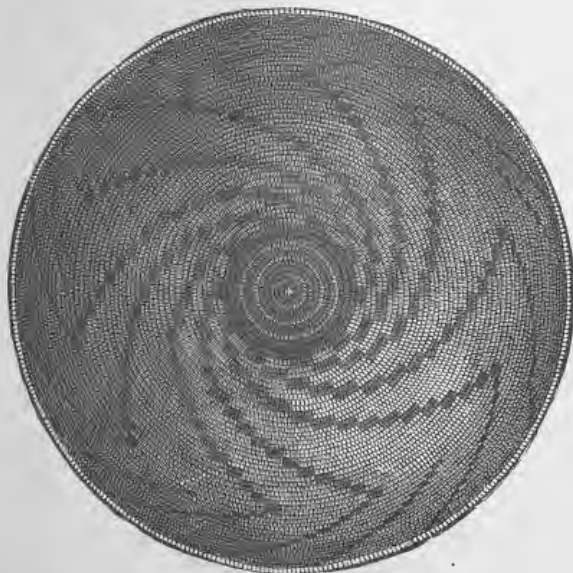
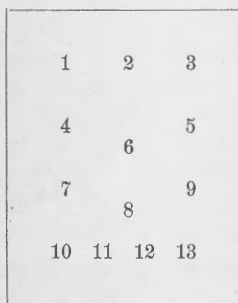


Fig. 299.

BASKETWORK WITH MANY-ARMED VOLUTES.

Fourth Annual Report of the Bureau of Ethnology, fig. 485.

EXPLANATION OF PLATE 19.



VARIOUS FORMS OF CROSSES IN USE AMONG NORTH AMERICAN INDIANS, FROM GREEK CROSS TO SWASTIKA.

Fig. 1. GREEK CROSS.

2. GREEK CROSS.

3. CROSS ON COPPER.

4. CROSS ON SHELL.

5. GREEK CROSS.

6. GREEK CROSS.

7. LATIN CROSS (Copper).

Fig. 8. GREEK CROSS.

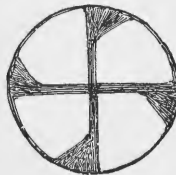
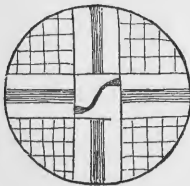
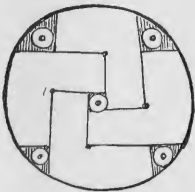
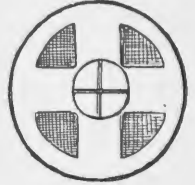
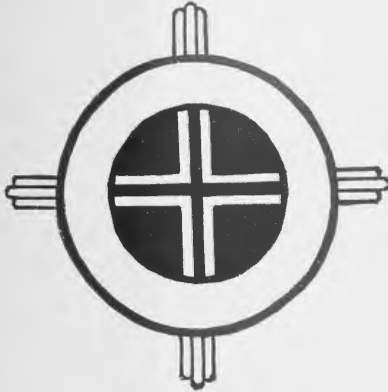
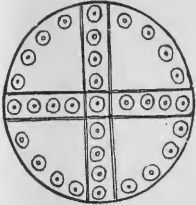
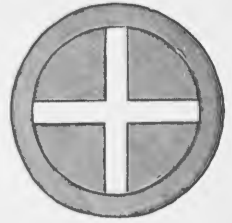
9. LATIN CROSS (Copper).

10. SWASTIKA ON SHELL.

11. SWASTIKA ON SHELL.

12. SWASTIKA ON POTTERY.

13. SWASTIKA ON POTTERY.



VARIOUS FORMS OF CROSSES IN USE AMONG NORTH AMERICAN INDIANS, FROM GREEK CROSS TO SWASTIKA.

and four are executed upon copper. With two exceptions, they are inclosed in circles, and hence are symmetrical Greek crosses, the ends being rounded to conform to a circle."¹ Figs. 7 and 9 of pl. 19 represent forms of the Latin cross, and are modern, having doubtless been introduced by European priests. Figs. 10 to 13 are representatives of the Swastika in some of its forms.

The U. S. National Museum possesses a small shell ornament (fig. 305) in the form of a cross, from Lenoir's burial place, Fort Defiance, Caldwell County, N. C., collected by Dr. Spainhour and Mr. Rogan, the latter being an employé of the Bureau of Ethnology. It is in the form of a Greek cross, the four arms crossing at right angles and being of equal length. The arms are of the plain shell,

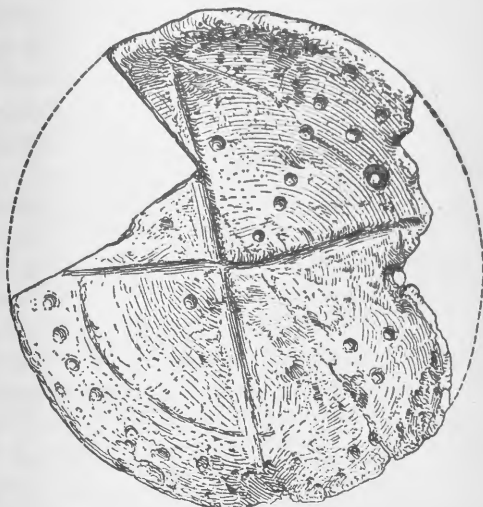


Fig. 304.

ENGRAVED SHELL DISK GORGET.

Rude cross with many dots.

Lick Creek, Tenn.

Second Annual Report of the Bureau of Ethnology, pl. 52, fig. 2.

while they are brought to view by the field being cross-hatched. The specimen has, unfortunately, been broken, and being fragile has been secured in a bed of plaster.

This and the foregoing specimens have been introduced into this paper that the facts of their existence may be presented for consideration, and to aid in the determination whether the cross had any peculiar or particular meaning.

The questions

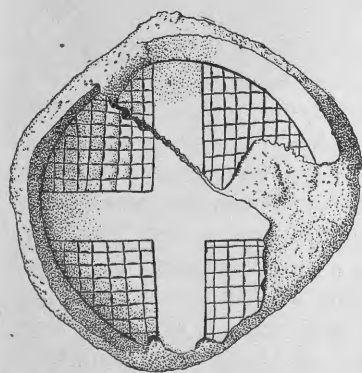


Fig. 305.

ENGRAVED SHELL WITH FIGURE OF GREEK CROSS.

Caldwell County, N. C.

Cat. No. 23169, U. S. N. M.

involuntarily arise, Was it a symbol with a hidden meaning, religious or otherwise; was it the

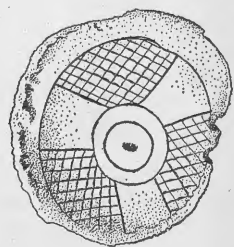


Fig. 306.

ENGRAVED SHELL WITH THREE-ARMED CROSS (TRISKELION).

Lick Creek, Tenn.

Cat. No. 83170, U. S. N. M.

¹ Second Ann. Rep. Bureau of Ethnology, 1880-81, pp. 272, 273.

totem of a clan, the insignia of a ruler, the charm of a priesthood, or did it, with all the associated shell engravings, belong to the category of trinkets? These questions may be partially answered in the section on the meanings given to the cross by the North American Indians (p. 933).

There is also introduced, as bearing on the question, another shell ornament (fig. 306), the style, design, and workmanship of which has such resemblance to the foregoing that if they had not been (as they were) found together we would be compelled to admit their identity of origin, yet the latter specimen has but three arms instead of four. This might take it out of the category of crosses as a symbol of any religion of which we have



Fig. 307.

DRILLED AND ENGRAVED SHELL OR
"RUNTEE."

Dotted Greek cross and circle.
Arizona.

knowledge. Many of the art objects in shell heretofore cited were more or less closely associated; they came from the same neighborhood and were the results of the same excavations, conducted by

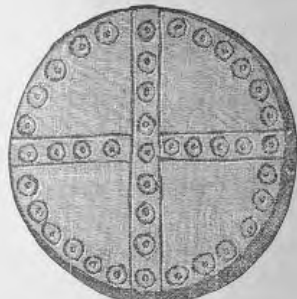


Fig. 308.

DRILLED AND ENGRAVED SHELL OR
"RUNTEE."
Dots and rings forming circle and
Greek cross.
Ohio.

the same
excava-
tors. In

determining the culture status of their makers, they must be taken together.

When we consider the variety of the designs which were apparently without meaning except for ornamentation, like the circles, meanders, zigzags, chevrons, herringbones, ogees, frets, etc., and the representations of animals such as were used to decorate the pipes of the aborigines, not alone the bear, wolf, eagle, and others which might be a totem and represent a given clan, but others which, according to our knowledge and imagination, have never served for such a purpose, as the man-

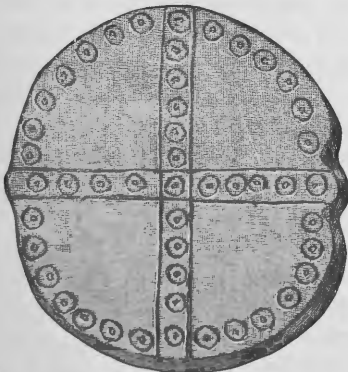


Fig. 309.

DRILLED AND ENGRAVED SHELL OR "RUNTEE."
Dots and rings forming circle and
Greek cross.

New York.

atee, beaver, wildcat, heron, finch, sparrow, crow, raven, cormorant, duck, toucan, goose, turkey, buzzard, cardinal, parroquet, conies, lizard; when we further consider that the cross, whether Greek, Latin, or Swastika form, is utterly unlike any known or possible totem of clan, insignia of ruler, or potent charm of priesthood; when we consider

these things, why should we feel ourselves compelled to accept these signs as symbols of a hidden meaning, simply because religious sects in different parts of the world and at different epochs of history have chosen them or some of them to represent their peculiar religious ideas? This question covers much space in geography and in time, as well as on paper. It is not answered here, because no answer can be given which would be accepted as satisfactory, but it may serve as a track or indication along which students and thinkers might pursue their investigations.

The U. S. National Museum possesses a necklace consisting of three shell ornaments, interspersed at regular intervals with about fifty small porcelain beads (fig. 307).¹ It was obtained by Capt. George M. Whipple from the Indians of New Mexico. These shell ornaments are similar to objects described by Beverly in his work on the "History of Virginia," page 145, as "runtees" and "made of the conch shell; only the shape is flat as a cheese and drilled edgewise." It is to be remarked that on its face as well as on figs. 308 and 309¹ appears a cross of the Greek form indicated by these peculiar indentations or drillings inclosed in a small circle. The specimen shown in fig. 308 is from an ancient grave in Upper Sandusky, Ohio, and that shown in fig. 309 from an Indian cemetery at Onondaga, N.Y. Similar specimens have been found in the same localities.

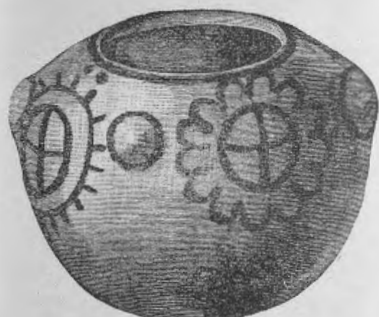


Fig. 310.

POTTERY JAR WITH CROSSES, ENCIRCLING RAYS AND SCALLOPS.

Third Annual Report of the Bureau of Ethnology, fig. 188.

THE CROSS ON POTTERY.

Fig. 310 shows a small globular cup of dark ware from the vicinity of Charleston, Mo.; height, $2\frac{1}{2}$ inches; width, $3\frac{1}{2}$ inches. It has four large nodes or projections, and between them, painted red, are four ornamental circles, the outside one of which is scalloped or rayed, while the inside one bears the figure of a Greek cross. The specimen shown in fig. 311 (Cat. No. 47197, U.S.N.M.) is a medium-sized decorated olla with scalloped margin, from New Mexico, collected by Colonel Stevenson. It has two crosses—one Greek, the other Maltese—both inclosed in circles and forming centers of an elaborate, fanciful, shield-like decoration. In fig. 312 (Cat. No. 39518, U.S.N.M.) is shown a Cochiti painted water vessel, same collection, showing a Maltese cross.

Dozens of other specimens are in the collections of the U. S. National Museum which would serve to illustrate the extended and extensive

¹ Schoolcraft, "History of the Indian Tribes," III, pl. 25; Second Ann. Rep. Bureau of Ethnology, 1880-81, pl. 36.



Fig. 311.

OLLA DECORATED WITH GREEK AND MALTESE CROSSES.

Second Annual Report of the Bureau of Ethnology, fig. 708.

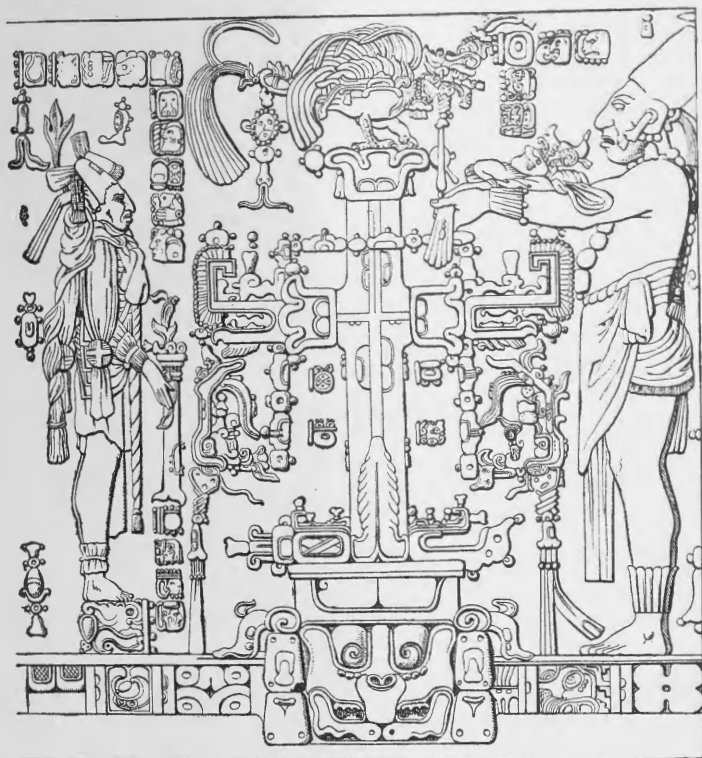


Fig. 312.

POTTERY WATER VESSEL.

Maltese cross.

Second Annual Report of the Bureau of Ethnology, fig. 642.



PALENQUE CROSS, FOLIATED.

Smithsonian Contributions to Knowledge, Vol. xxii, fig. 7.

use of the cross in great variety of forms, so that no argument as to either the meaning or the extent of the cross can be based on the supposition that these are the only specimens. Fig. 313 (Cat. No. 132975, U.S.N.M.) shows a vase from Mexico, about 8 inches high, of fine red ware, highly polished, with an elaborate decoration. Its interest here is the Maltese cross represented on each side, with a point and concentric circles, from the outside of which are projecting rays. This may be the symbol of the sun, and if so, is shown in connection with the cross. This style of cross, with or without the sun symbol, is found in great numbers in Mexico—as, for example, the great cross, pl. 20, from the temple at Palenque.¹

SYMBOLIC MEANINGS OF THE CROSS.

It would be an excellent thing to dissect and analyze the Swastika material we have found; to generalize and deduce from it a possible theory as to the origin, spread, and meaning of the Swastika and its related forms, and endeavor, by examination of its associated works, to discover if these were religious symbols or charms or mere decorations; and, following this, determine if possible whether the spread of these objects, whatever their meaning, was the result of migration, contact, or communication. Were they the result of similar, but independent, operations of the human mind, or were they but duplicate inventions, the result of parallelism in human thought? This investigation must necessarily be theoretical and speculative. The most that the author proposes is to suggest probabilities and point the way for further investigation. He may theorize and speculate, but recognizes what many persons seem not able to do—that speculation and theory are not to be substituted for cold facts. He may do no more than propound questions from which other men, by study, experience, philosophy, or psychology, may possibly evolve some general principle, or a theory pointing to a general principle, concerning the mode of extension and spread of culture among separate and independent peoples. When the facts shall have been gathered, marshaled, arranged side by side, and each aggregation of facts shall have been weighed, *pro* and *con*, and its fair value given “without

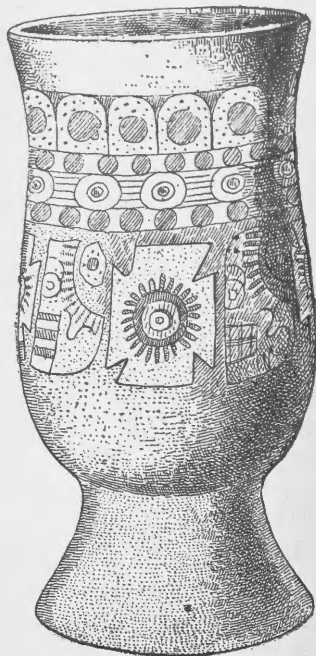


Fig. 313.

POTTERY VASE FINELY DECORATED IN RED AND WHITE GLAZE.

Maltese cross with sun symbol (?).

Cat. No. 132975, U. S. N. M.

¹ Smithsonian Contributions to Knowledge, p. 33, pl. 14, fig. 7.

prejudice or preconceived opinion," then will be time enough to announce the final conclusion, and even then not dogmatically, but tentatively and subject to future discoveries.

Throughout this paper the author has sought but little more than to prepare material on the Swastika which can be utilized by those who come after him in the determination of the difficult and abstruse problems presented.

It is rare in the study of archæology and, indeed, in any science, that a person is able to assert a negative and say what does not exist. The present investigations are rendered much more comprehensive by the appearance of the extensive and valuable work of Col. Garrick Mallery in the Tenth Annual Report of the Bureau of Ethnology, on the subject of "Picture Writing of the American Indians." It is a work of about 800 pages, with 1,300 illustrations, and is the result of many years of laborious study. It purports to be a history, more or less complete, of the picture writing, signs, symbols, totems, marks, and messages of the American Indian, whether pictographs or petroglyphs. A large portion of his work is devoted to ideography, conventional signs, syllabaries and alphabets, homographs and symmorphs, and their respective means of interpretation. Among these he deals, not specifically with the Swastika, but in general terms with the cross. Therefore, by looking at Colonel

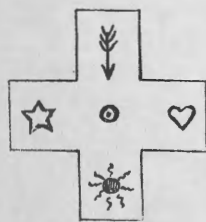


Fig. 314.

GREEK CROSS REPRESENTING
WINDS FROM CARDINAL
POINTS.

Dakota Indians.
Tenth Annual Report of the Bureau
of Ethnology, fig. 1255.

Mallery's work upon this chapter (p. 724), one is able to say negatively what has not been found.

Apropos of the meanings of the cross among the North American Indians Count Goblet d'Alviella says:¹

It is nevertheless incontestable that the pre-Columbian cross of America is a "rose des vents," representing the four directions whence comes the rain, or the cardinal points of the compass, etc., etc.

Colonel Mallery's volume shows that it meant many other things as well.

The four winds.—The Greek cross is the form found by Colonel Mallery to be most common among the North American aborigines, possibly because it is the simplest. In this the four arms are equal in length, and the sign placed upright so that it stands on one foot and not on two, as does the St. Andrew's cross. The Greek cross (fig. 314) represents, among the Dakotas, the four winds issuing out of the four caverns in which souls of men existed before the incarnation of the human body. All the medicine men—that is, conjurors and magicians—recollect their previous dreamy life in these places, and the instructions then received from the gods, demons, and sages; they recollect and describe their preexistent life, but only dream and speculate as to the future life beyond the grave. The top of the cross is the cold,

¹"La Migration des Symboles," p. 18.

all-conquering giant, the North Wind, most powerful of all. It is worn on the body nearest the head, the seat of intelligence and conquering devices. The left arm covers the heart; it is the East Wind, coming from the seat of life and love. The foot is the melting, burning South

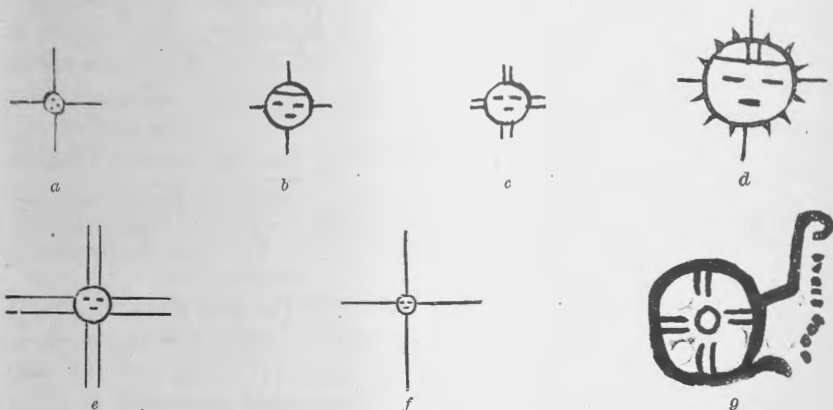


Fig. 315.

THE CROSS IN CONNECTION WITH THE CIRCLE.

Sun symbols(?).

Tenth Annual Report of the Bureau of Ethnology, figs. 1118, 1120, 1126.

Wind, indicating, as it is worn, the seat of fiery passion. The right arm is the gentle West Wind, blowing from the spirit land, covering the lungs, from which the breath at last goes out gently, but into unknown night. The center of the cross is the earth and man, moved by the conflicting influences of gods and winds.

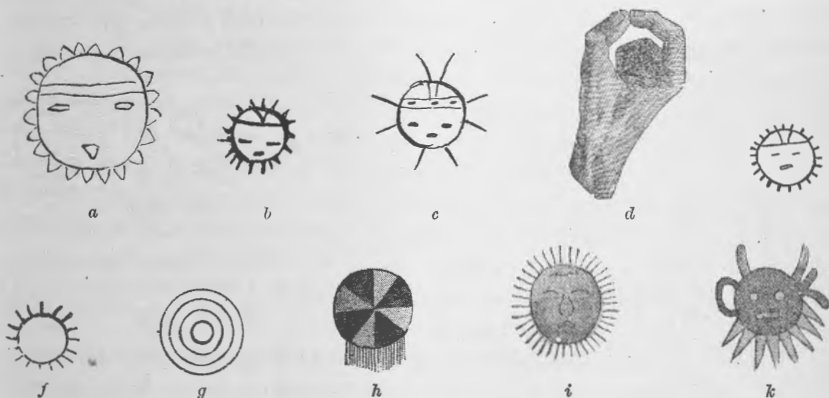


Fig. 316.

FIGURES OF CIRCLES AND RAYS PROBABLY REPRESENTING SUN SYMBOLS.

Tenth Annual Report of the Bureau of Ethnology, figs. 1118-1121, 1123.

Rev. John McLain, in his work on the "Blackfoot Sun-dance," says:

On the sacred pole of the sun lodge of the Blood Indian is a bundle of small brushwood taken from the birch tree, which is placed in the form of a cross. This was an ancient symbol evidently referring to the four winds.

Sun and star symbols.—Great speculation has been made, both in Europe and America, over the relation between the Swastika and the sun, because the two signs have been associated by primitive peoples.

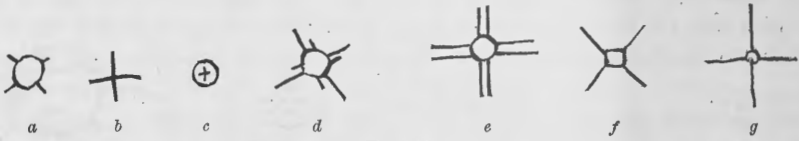


Fig. 317.

FIGURES OF CROSSES AND CIRCLES REPRESENTING STAR SYMBOLS.

Oakley Springs, Ariz.

Tenth Annual Report of the Bureau of Ethnology, fig. 1129.

Colonel Mallery gives the Indian signs for the sun, stars, and light.¹ These have been segregated, and it will be seen that the cross and circle are used indiscriminately for one and the other, and the fact of the two being found associated is no evidence of relationship in religious ideas (figs. 315–319).



Fig. 318.

STAR SYMBOL.

Circle and rays without cross.

Oakley Springs, Ariz.

Tenth Annual Report of the Bureau of Ethnology, fig. 1129.

Dwellings.—Among the Hidatsa, the cross and the circle represent neither the sun nor any religious ideas, but merely lodges, houses, or dwellings. The crosses in fig. 319 represent Dakota lodges; the small circles signify earth lodges, the points representing the supporting poles. Buildings erected by civilized people were represented by small rectangular figures, while the circles with dots in a square represent earth lodges, the home of the Hidatsa.

with dots in a square represent earth lodges, the home of the Hidatsa.

Dragon fly (Susbeca).—Among some of the Indian tribes, the Dakotas among others, the Latin cross is found, i. e., upright with three members of equal length, and the fourth, the foot, much longer. The use of this symbol antedates the discovery of America, and is carried back in tradition and myth. This sign signifies the mosquito hawk or the dragon fly (fig. 320). It is called in that language the “Susbeca,” and is a supernatural being gifted with speech, warning man of danger, approaching his ear silently and at right angles, saying, “Tei,” “tei,” “tei,” an interjection equivalent to “Look out!” “You are surely going to destruction!” “Look out!”

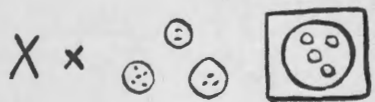


Fig. 319.

FIGURES OF CROSSES, CIRCLES, AND SQUARES REPRESENTING LODGES

Dakota Indians.

Tenth Annual Report of the Bureau of Ethnology, fig. 1903.

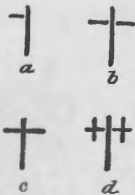


Fig. 320.

LATIN CROSSES REPRESENTING THE DRAGON FLY.

Dakota Indians.

“Tei,” “tei,” “tei!” The adoption of the dragon fly as a mysterious and

¹ Tenth Ann. Rep. Bureau of Ethnology, 1888–89, figs. 1118–1129.

supernatural being is on account of its sudden appearance in numbers. In the still of the evening, when the shades of darkness come, then is heard in the meadows a sound as of crickets or frogs, but indistinct and prolonged; on the morrow the *Susbeca* will be hovering over it. It is the sound of their coming, but whence no one knows. The cross not only represents the shape of the insect, but also the angle of its approach. It is variously drawn, but usually as in fig. 320 *a* or *b*, and, in painting or embroidery, *c*, and sometimes *d*.

Fig. 321 is described in Keam's MS. as follows:

This is a conventional design of dragon flies, and is often found among rock etchings throughout the plateau [Arizona]. The dragon flies have always been held in great veneration by the Mokis and their ancestors, as they have been often sent by Oman to reopen springs which Muingwa had destroyed and to confer other benefits upon the people.

This form of the figure, with little vertical lines added to the transverse lines, connects the *Batol-atci* with the *Ho-bo-bo* emblems. The youth who was sacrificed and translated by *Ho-bo-bo* reappeared a long time afterwards, during a season of great drought, in the form of a gigantic dragon fly, who led the rain clouds over the lands of *Ho-pi-tu*, bringing plenteous rains.

Midē' or Shamans.—Colonel Mallery (or Dr. Hoffman) tells us (p. 726) that among the Ojibways of northern Minnesota the cross is one of the sacred symbols of the Society of *Midē' or Shamans* and has special reference to the fourth degree. The building in which the initiation is carried on has its opening toward the four cardinal

points. The cross is made of saplings, the upright poles approaching the height of four to six feet, the transverse arms being somewhat shorter, each being of the same length as the top; the upper parts are painted white or besmeared with white clay, over which are spread small spots of red, the latter suggesting the sacred shell of *Midē'*, the symbol of the order. The lower arm of the pole is square, the side toward the east being painted white to denote the source of light and warmth; the face on the south is green, denoting the source of the thunder bird which brings the rains and vegetation; the surface toward the west is covered with vermilion, relating to the land of the setting sun, the abode of the dead; the north is painted black, as the direction from which comes affliction, cold, and hunger.

Flocks of birds.—Groups of small crosses on the sides of Eskimo bow



Fig. 321.

DOUBLE CROSS OF SIX ARMS REPRESENTING THE DRAGON FLY.

Moki Indians, Arizona.

Tenth Annual Report of the Bureau of Ethnology, fig. 1165.

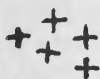


Fig. 322

FIGURES OF CROSSES AS USED BY THE ESKIMO TO REPRESENT FLOCKS OF BIRDS.

Tenth Annual Report of the Bureau of Ethnology, fig. 1228.

Cat. Nos. 44211 and 45020, U. S. N. M.

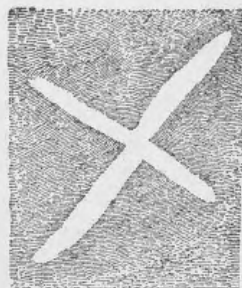


Fig. 323.

PETROGLYPH FROM TULARE VALLEY, CALIFORNIA.

Large white Greek cross.

Tenth Annual Report of the Bureau of Ethnology, fig. 1229.

drills represent flocks of birds (Cat. Nos. 45020 and 44211, U.S.N.M.). They are reproduced in fig. 322. Colonel Mallery's fig. 28, page 67, represents a cross copied from the Najowe Valley group of colored pictographs, 40 miles west of Santa Barbara, Santa Barbara County, Cal.

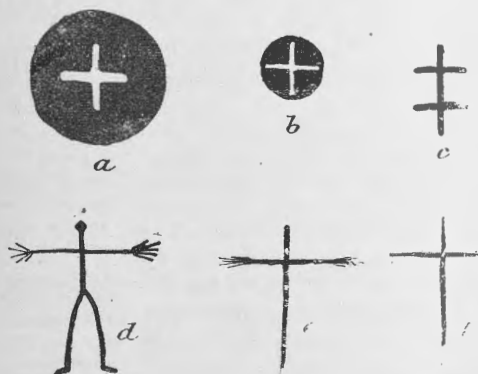


Fig. 324.

PETROGLYPHS FROM OWENS VALLEY, CALIFORNIA.

(a, b) Greek crosses, (c) double Latin cross, (d-f) Latin crosses representing human figures.

Tenth Annual Report of the Bureau of Ethnology, fig. 1230.

red, while the outside line is a faded-black tint. The cross measures nearly a foot in extent. At the Tulare Indian Agency, Cal., is an immense boulder of granite. It has been split, and one of the lower quarters has been moved sufficiently to leave a passageway six feet wide and nearly ten feet high. The interior walls are well covered with large painted figures, while upon the ceilings are numerous forms of animals, birds, and insects. Among this latter group is a white cross about 18 inches in length (fig. 323), presenting a unique appearance, for the reason that it is the only petroglyph in that region to which the white coloring matter has been applied.

An interesting example of rock sculpturing in groups is in Owens Valley, south of Benton, Cal. Among them are various forms of crosses, and circles containing crosses of simple and complex types. The most interesting in this connection are the groups in fig. 324, *a* and *b*. The larger one, *a*, occurs upon a large boulder of trachite 16 miles south of Benton, at the "Chalk grave." The circle is a depression about one inch in depth, the cross being in high relief. The small cross *b*, found three miles north from this is almost identical, the arms of the cross, however, extending to the rim of the circle. In this locality occurs also the cross, *c*, same figure, and some examples having more than two cross arms.

Human forms.—Other simple crosses represent the human form.

The cross measured 20 inches in length, the interior being painted black while the border is of a dark red tint. This design, as well as others in close connection, is painted on the walls of a shallow cave or rock shelter in the limestone formation. Fourteen miles west of Santa Barbara, on the summit of the Santa Ynez Mountains, is a cavern having a large opening west and north, in which

are crosses of the Greek type, the interior portion being painted a dull earthy

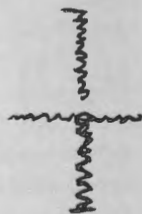


Fig. 325.

CROSS IN ZIGZAG LINES REPRESENTING THE HUMAN FORM.

Navajo Indians.

Some of these are engraved or cut on the rocks of Owens Valley and are similar to those above described (fig. 324), but they have been eroded, so that beyond the mere cross they show slight relation to the human body (fig. 324, *d, e, f*). Col. James Stevenson, describing the Hasjelti ceremony of the Navajoes,¹ shows the form of a man drawn in the sand (fig. 325). Describing the character shown in fig. 326, Keam says: "The figure represents a woman. The breath is displayed in the interior."²

Maidenhood.—Concerning fig. 327 Keam, in his manuscript, says the Maltese cross was the emblem of a virgin, and is still so recognized by the Moki. It is a conventional development of the common emblem of maidenhood, wherein the maidens wear their hair arranged as in a disk three or four inches in diameter on each side of the head (fig. 327 *b*). This discoidal arrangement of the hair is typical of the emblem of fructification worn by the virgin in the Muingwa festival. Sometimes the hair, instead of being worn in the complete discoidal form, is dressed upon two curving twigs, and presents the form of two semicircles upon each side of the head. The partition of these is sometimes horizontal, sometimes vertical. The combination of these styles (fig. 327*a* and *b*) present the forms from which the Maltese cross was conventionalized.³

*a**b*

Fig. 327.

MALTESE AND SAINT ANDREW'S
CROSSES.

Emblems of maidenhood.

Moki Indians.

significations. It appears "as the tribal sign for Cheyenne" (p. 383); "as Dakota lodges" (p. 582); "as a symbol for trade or exchange" (p. 613); "as a conventional sign for prisoners" (p. 227); "for personal exploits while elsewhere it is used in simple enumeration" (p. 348). Although this device is used for a variety of meanings when it is employed ceremonially or in elaborate pictographs of the Indians both of North and South America, it represents the four winds. This view long ago was suggested as being the signification of many Mexican crosses, and it is



Fig. 326.

MALTESE CROSS(?)
REPRESENTING A
WOMAN.The figure in the
center is in-
tended to indi-
cate the breath.

Shaman's spirit.—Among the Kiatéxamut and Innuït tribes, a cross placed on the head, as in fig. 328, signified a shaman's evil spirit or demon. This is an imaginary being under the control of the shaman to execute his wishes.⁴

Divers significations.—The figure of the cross among the North American Indians, says Colonel Mallery,⁵ has many differing sig-



Fig. 328.

CROSS WITH
BIFURCATED
FOOT.Used by the
Innuïts to
represent a
shaman or
evil spirit.¹ Eighth Ann. Rep. Bureau of Ethnology, p. 283.² Tenth Ann. Rep. Bureau of Ethnology, 1888-89, fig. 1165.³ Ibid., fig. 1232.⁴ Ibid., fig. 1231.⁵ Ibid., p. 729.

sustained by Prof. Cyrus Thomas in his "Notes on Mayan Mexican Manuscript,"¹ where strong confirmatory evidence is produced by the arms of the crosses having the appearance of conventionalized wings similar to some representations of the thunder bird of the northern tribes; yet the same author, in his paper on the study of the "Troano Manuscript,"² gives fig. 329 as a symbol for wood, thus further showing the manifold concepts attached to the general form of the cross. Banelier thinks that the cross so frequently used by the aborigines of Mexico and Central America were merely ornaments and not objects of worship, while the so-called crucifixes, like that on the Palenque tablet, were only the symbol of the "new fire," or the close of the period of fifty-two years. He believes them to be representations of the fire drills more or less ornamented. Zamacois³ says that the cross was used in the religion of various tribes of the peninsula of Yucatan, and that it represented the god of rain.

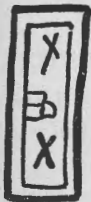


Fig. 329.

ST. ANDREW'S
CROSSES, USED
AS A SYMBOL
FOR WOOD.

Tenth Annual Re-
port of the Bureau
of Ethnology, fig.
1233.

It is a favorite theory with Major Powell, Director of the Bureau of Ethnology, that the cross was an original invention of the North American Indian, possibly a sign common to all savages; that it represented, first, the four cardinal points, north, south, east, and west; and afterwards by accretion, seven points, north, south, east, west, zenith, nadir, and here.

Capt. John G. Bourke, in his paper on the "Medicine Men of the Apache"⁴ discourses on their symbolism of the cross. He says it is related to the cardinal points, to the four winds, and is painted by warriors on their moccasins when going through a strange district to keep them from getting on a wrong trail. He notes how he saw, in October, 1884, a procession of Apache men and women bearing two crosses, 4 feet 10 inches long, appropriately decorated "in honor of Guzanutli to induce her to send rain."

Dr. Brinton⁵ tells of the rain maker of the Lenni Lenape who first drew on the earth the figure of a cross. Captain Bourke quotes from Father Le Clerq⁶ as to the veneration in which the cross was held by the Gaspesian Indians, also from Herrera to the same effect. Professor Holmes⁷ makes some pertinent observations with regard to the meanings of the cross given by the American Indians:

Some very ingenious theories have been elaborated in attempting to account for the cross among American symbols. Brinton believes that the great importance attached to the points of the compass—the four quarters of the heavens—by savage

¹ Second Ann. Rep. Bureau of Ethnology, p. 61.

² Contrib. North American Ethnology, v, p. 144.

³ "Historia de Mexico," I, p. 238.

⁴ Ninth Ann. Rep. Bureau of Ethnology, 1887-88, p. 479.

⁵ "Myths of the New World," p. 96.

⁶ "Gaspesi," London, 1691, pp. 170, 172, 199.

⁷ Second Ann. Rep. Bureau of Ethnology, 1880-81, p. 270.

peoples, has given rise to the sign of the cross. With others, the cross is a phallic symbol derived, by some obscure process of evolution, from the veneration accorded to the procreative principle in nature. It is also frequently associated with sun worship, and is recognized as a symbol of the sun—the four arms being remaining rays after a gradual process of elimination. Whatever is finally determined in reference to the origin of the cross as a religious symbol in America will probably result from exhaustive study of the history, language, and art of the ancient peoples, combined with a thorough knowledge of the religious conceptions of modern tribes, and when these sources of information are all exhausted it is probable that the writer who asserts more than a probability will overreach his proofs.



Fig. 330.

GRAPHIC DELINEATION OF ALLIGATOR.

From a vase of the lost color group.

Chiriqui.

Sixth Annual Report of the Bureau of Ethnology, fig. 257.

* * * A study of the designs, associated with the cross in these gorgets [figs. 302–304] is instructive, but does not lead to any definite result; in one case the cross is inscribed on the back of a great spider [figs. 275–278]; in another it is surrounded by a rectangular framework of lines, looped at the corners and guarded by four mysterious birds [figs. 263–266], while in others it is without attendant characters, but the workmanship is purely aboriginal. I have not seen a single example of engraving upon the shell that suggested a foreign hand, or a design, with the exception of this one [a cross], that could claim a European derivation. * * * Such delineations of the cross as we find embodied in ancient aboriginal art, represent only the final stages of its evolution, and it is not to be expected that its origin can be traced through them.

Continuing in his "Ancient Art in Chiriqui,"¹ presenting his "Series showing stages in the simplification of animal characters," and "derivation of the alligator," Professor Holmes elaborates the theory how the alligator was the original, and out of it, by evolution, grew the cross. His language and accompanying figures are quoted:



Fig. 331.

GRAPHIC DELINEATION OF ALLIGATOR.

From a vase of the lost color group.

Chiriqui.

Sixth Annual Report of the Bureau of Ethnology, fig. 258.

Of all the animal forms utilized by the Chiriquians, the alligator is the best suited to the purpose of this study, as it is presented most frequently and in the most varied forms. In figs. 257 and 258 [figs. 330 and 331 in the present paper] I reproduce drawings

from the outer surface of a tripod bowl of the lost color group. Simple and formal as these figures are, the characteristic features of the creature—the sinuous body, the strong jaws, the upturned snout, the feet, and the scales—are forcibly expressed. It is not to be assumed that these examples represent the best delineative skill of the Chiriquian artist. The native painter must have executed very

¹ Sixth Ann. Rep. Bureau of Ethnology, p. 173 et seq., figs. 257–278.

much superior work upon the more usual delineating surfaces, such as bark and skins. The examples here shown have already experienced decided changes through the constraints of the ceramic art, but are the most graphic delineations preserved to us. They are free-hand products, executed by mere decorators, perhaps by women, who were servile copyists of the forms employed by those skilled in sacred art.



Fig. 332.

CONVENTIONAL FIGURE OF ALLIGATOR.

From a vessel of the lost color group.

Chiriqui.

Sixth Annual Report of the Bureau of Ethnology, fig. 259.

First, and most potent, may be mentioned the enforced limits of the spaces to be decorated, which spaces take shape independently of the subject to be inserted. When the figures must occupy a narrow zone, they are elongated; when they must occupy a square, they are restricted longitudinally, and when they occupy a circle, they are of necessity coiled up. Fig. 265 [fig. 333 of the present paper] illustrates the effect produced by crowding the oblong figure into a short rectangular space. The head is turned back over the body and the tail is thrown down along the side of the space. In fig. 266 [fig. 334 of the present paper] the figure occupies a circle and is, in consequence, closely coiled up, giving the effect of a serpent rather than an alligator. * * *



Fig. 333.

CONVENTIONAL FIGURE OF ALLIGATOR
CROWDED INTO A SMALL GEOMETRICAL
FIGURE.

Chiriqui.

Sixth Annual Report of the Bureau of Ethnology, fig.
265.

Fig. 334.

CONVENTIONAL FIGURE
OF ALLIGATOR
CROWDED INTO A CIR-
CLE.

Chiriqui.

Sixth Annual Report of the
Bureau of Ethnology, fig.
266.

I present five series of figures designed to illustrate the stages through which life forms pass in descending from the realistic to highly specialized conventional shapes. In the first series (fig. 277) [fig. 335 of the present paper] we begin with *a*, a meager but graphic sketch of the alligator; the second figure, *b*, is hardly less characteristic, but is much simplified; in the third, *c*, we have still three leading features of the creature—the body line, the spots, and the stroke at the back of the head; and in the fourth, *d*, nothing remains but a compound yoke-like curve, standing for the body of the creature, and a single dot.

The figures of the second series (fig. 278) [fig. 336 of the present paper] are nearly all painted upon low, round nodes placed about the body of the alligator vases, and hence are

inclosed in circles. The animal figure in the first example is coiled up like a serpent [fig. 334], but still preserves some of the well-known characters of the alligator. In the second example [fig. 336 *b*] we have a double hook near the center of the space which takes the place of the body, but the dotted triangles are placed separately against the encircling line. In the next figure the body symbol is omitted and

A third illustration from the same group of ware, given in fig. 259 [fig. 332 of the present paper] shows, in some respects, a higher degree of convention. * * *

I shall now call attention to some important individualized or well-defined agencies of convention.

the three triangles remain to represent the animal. In the fourth there are four triangles, and the body device being restored in red takes the form of a cross. In the fifth two of the inclosing triangles are omitted and the idea is preserved by the simple dots. In the sixth the dots are placed within the bars of the cross, the triangles becoming mere interspaces, and in the seventh the dots form a line between the two encircling lines. This series could be filled up by other examples, thus showing by

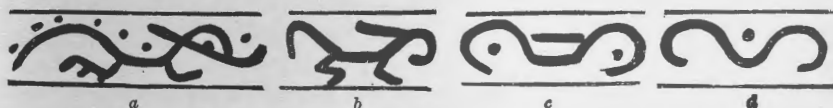


Fig. 335.

SERIES OF FIGURES OF ALLIGATORS SHOWING STAGES OF SIMPLIFICATION.

Chiriqui.

Sixth Annual Report of the Bureau of Ethnology, fig. 277.

what infinitesimal steps the transformations take place. * * *

We learn by the series of steps illustrated in the annexed cuts that the alligator radical, under peculiar restraints and influences, assumes conventional forms that merge imperceptibly into these classic devices.

Professor Holmes's theory of the evolution of the cross from the alligator and its location in Chiriqui is opposed to that of Professor Good-

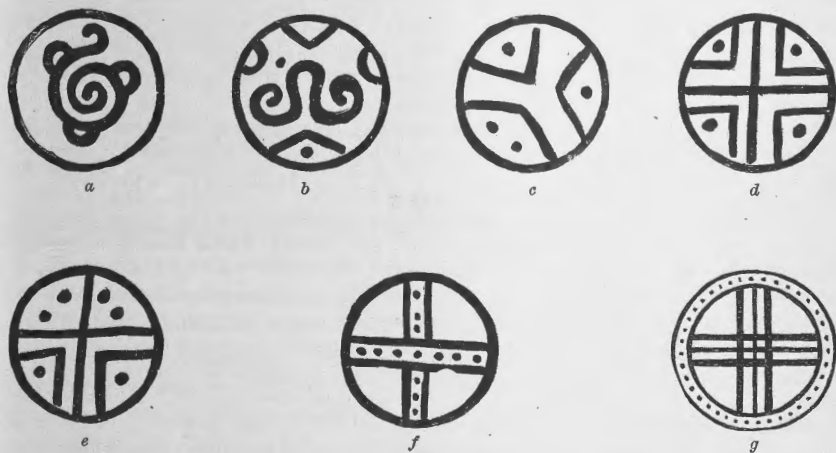


Fig. 336.

SERIES SHOWING STAGES IN THE SIMPLIFICATION OF ANIMAL CHARACTERS, BEGINNING WITH THE ALLIGATOR AND ENDING WITH THE GREEK CROSS.

Chiriqui.

Sixth Annual Report of the Bureau of Ethnology, fig. 278.

year, who, in his "Grammar of the Lotus," ascribes the origin of the cross to the lotus and locates it in Egypt. I file what in law would be an "interpleader"—I admit my want of knowledge of the subject under discussion, and leave the question to these gentlemen.

INTRODUCTION OF THE CROSS INTO AMERICA.

Professor Holmes is, in the judgment of the author, correct when he insists upon the aboriginal character of the cross in America. We all understand how it is stated that the Spanish missionaries sought to deny this and to connect the apparition of St. Thomas with the appearance of the cross. Professor Holmes¹ says:

The first explorers were accompanied by Christian zealots who spared no effort to root out the native superstition and introduce a foreign religion of which the cross was the all-important symbol. This emblem was generally accepted by the savages as the only tangible feature of a new system of belief that was filled with subtleties too profound for their comprehension. As a result, the cross was at once introduced into the regalia of the natives, at first probably in a European form and material, attached to a string of beads in precisely the manner they had been accustomed to suspend their own trinkets and gorgets; but soon, no doubt, delineated or carved by their own hands upon tablets of stone and copper and shell in the place of their own peculiar conceptions.

There is sufficient evidence, and to spare, of the aboriginal use of the cross in some of its forms, without resorting to the uncertain and forced explanation of its introduction by Christian missionaries. It is possible that the priests and explorers were, like Colonel Mallery's missionary, mistaken as to the interpretation given to the cross by the Indians. Dr. Hoffman, in his paper on the "Midē'wiwin or Grand Medicine Society of the Ojibwa,"² states the myth of the re-creation of the world "as thrown together in a mangled form by Hennepin." Dr. Hoffman observes:

It is evident that the narrator has sufficiently distorted the traditions to make them conform as much as practicable to the Biblical story of the birth of Christ.

And on the same page he quotes from Père Marquette, who says:

"I was very glad to see a great cross set up in the middle of the village, adorned with several white skins, red girdles, bows, and arrows, which that good people offered to the Great Manitou to return him their thanks for the care he had taken of them during the winter, and that he had granted them a prosperous hunting."

Marquette [comments Dr. Hoffman] was, without doubt, ignorant of the fact that the cross is the sacred post, and the symbol of the fourth degree of the Midē'wiwin, as is fully explained in connection with that grade of society. The erroneous conclusion that the cross was erected as an evidence of the adoption of Christianity and, possibly as a compliment to the visitor was a natural one on the part of the priest, but this same symbol of the Midē' society had probably been erected and bedecked with barbaric emblems and weapons months before anything was known of him.

Most aboriginal objects bearing crosses are from localities along the Ohio River and through Kentucky and Tennessee, a locality which the early Christian missionaries never visited, and where the cross of Christ was rarely, if ever, displayed until after that territory became part of the United States. Per contra, the localities among the Indians in which the early missionaries most conducted their labors—that is to say, along the Great Lakes and throughout northern

¹ Second Ann. Rep. Bureau of Ethnology, p. 269.

² Seventh Ann. Rep. Bureau of Ethnology, p. 155.

Illinois—produce the fewest number of aboriginal crosses. This was the country explored by Fathers Marquette, Lasalle, and Hennepin, and it was the scene of most of the Catholic missionary labors. Professor Holmes seems to have recognized this fact, for he says:¹

The cross was undoubtedly used as a symbol by the prehistoric nations of the South, and, consequently, that it was probably also known in the North. A great majority of the relics associated with it in the ancient mounds and burial places are undoubtedly aboriginal. In the case of the shell gorgets, the tablets themselves belong to an American type, and are highly characteristic of the art of the Mississippi Valley. A majority of the designs engraved upon them are also characteristic of the same district.

The author agrees heartily with Professor Holmes's argument in this matter, and his conclusion, when he says of these objects (p. 270):

The workmanship is purely aboriginal. I have not seen a single example of engraving upon shell that suggested a foreign hand or a design, with the exception of one (cross), that could claim a European derivation.

There have been numerous European or Catholic crosses, as well as many other objects of European manufacture or objects of civilized types, found among the Indians. There have been silver crosses found with images of the Virgin thereon, with Latin inscriptions, or of Roman letters; there have been glass beads, iron arrowheads, and divers other objects found in Indian graves which bore indubitable evidence of contact with the whites, and no one with any archaeological experience need be deceived into the belief that these were aboriginal or pre-Columbian manufacture. As a general rule, the line of demarkation between objects of Indian manufacture and those made by the whites is definite, and no practiced eye will mistake the one for the other. There may be exceptions, as where the Indian has lived with the whites or a white man with the Indians, or where an object is made with intent to deceive. In such cases one may have more trouble in determining the origin of the object.

There were many Indians who died and were buried within a century past, whose graves might contain many objects of white man's work. Black Hawk and Red Jacket are examples, and, possibly, King Philip. Indian graves have been opened in New England and New York containing the gun or firelock of the occupant of the grave buried with him, and that this was evidence of European contact there can be no doubt. So there have been hundreds, possibly thousands, of Indians buried since the Columbian discovery down to within the last decade whose graves contain white man's tools or implements. But no person with any archaeological experience need be deceived by these things. The theory that the Latin or Greek crosses or Swastikas shown on these gorgets, disks, and pottery furnish evidence of contact by the aborigines with Europeans in post-Columbian times is without foundation and inadmissible.

¹ Second Ann. Rep. Bureau of Ethnology, p. 269.

DECORATIVE FORMS NOT OF THE CROSS, BUT ALLIED TO THE SWASTIKA.

COLOR STAMPS FROM MEXICO AND VENEZUELA.

The aborigines of Mexico and Central and South America employed terra-cotta color stamps, which, being made into the proper pattern in



Fig. 337.



Fig. 338.



Fig. 339.

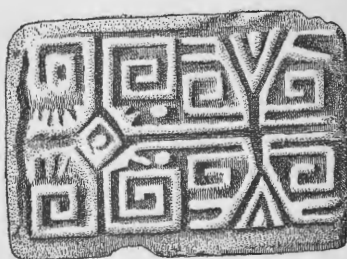


Fig. 340.



Fig. 341.



Fig. 342.

TERRA-COTTA COLOR STAMPS WITH DESIGNS SIMILAR TO THE SWASTIKA.
Mexico.

Cat. Nos. 99124, 99127, 27887, 99115, 99118, 99122, U. S. N. M.

the soft clay, were burned hard; then, being first coated with color, the stamp was pressed upon the object to be decorated, and so transferred

its color, as in the mechanical operation of printing, thus giving the intended decoration. Patterns of these stamps are inserted in this paper in connection with the Swastika because of the resemblance—not in form, but in style. They are of geometric form, crosses, dots, circles (concentric and otherwise), lozenges, chevrons, fret, and labyrinth or meander. The style of this decoration lends itself easily to the Swastika; and yet, with the variety of patterns contained in the series of stamps belonging to the U. S. National Museum, shown in figs. 337 to 342, no Swastika appears; nor in the similar stamps belonging to other collections, notably that of Mr. A. E. Douglass, in the Metropolitan Museum of Natural History, Central Park, New York, are any Swastikas shown. Of the foregoing figures, all are from Tlaltelolco, Mexico (Blake collection), except fig. 339, which is from the Valley of Mexico, and was received from the Museo Nacional de Mexico.

Marcano says:¹

The present Piaroas of Venezuela are in the habit of painting their bodies by a process different from that of the North American Indian. They make stamps of wood, which, being colored (as types are with ink), they apply to their bodies.

Fig. 982 shows examples of these stamps. [See fig. 343 of the present paper.] The designs are substantially the same as some petroglyphs. They either copied the models they found carved on the rocks by peoples who preceded them, or they knew the meaning and preserved the tradition. The former is the only tenable hypothesis. Painting is to the Piaroas both ornamentation and necessity. It serves, not only as a garment to protect them against insects, but becomes a fancy costume to grace their feasts and meetings.

These designs are not presented as Swastikas nor of any evolution or derivation from one. They show a style common enough to Central and South America, to the Antilles and the Canary Islands,² which might easily produce a Swastika. The aboriginal designer of these might, if we depend upon the theory of psychological similarity of culture among all peoples, at his next attempt make a Swastika. Yet, with the hundreds of similar patterns made during the centuries of aboriginal occupation and extending throughout the countries named, none of these seem ever to have produced a Swastika.

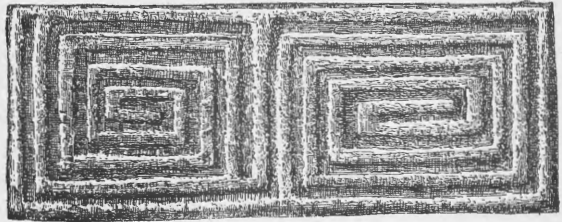
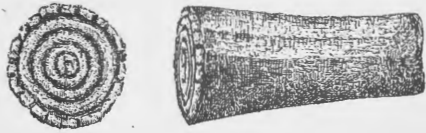


Fig. 343.

TERRA-COTTA COLOR STAMPS WITH DESIGNS SIMILAR TO THE SWASTIKA.

Piaroa Indians, Venezuela.

Tenth Annual Report of the Bureau of Ethnology, fig. 982.

¹Mem. Soc. d'Anthrop., Paris, 1890, p. 200.

²De Quatrefages, "Histoire Générale du Races Humaines," Introduction, p. 239, figs. 185-191, 193-194.

V.—SIGNIFICANCE OF THE SWASTIKA.

The origin and early history of the Swastika are lost in antiquity. All the author has been able to find on these subjects is set forth in the preceding chapters.

It is proposed to examine the possible uses of the Swastika in an endeavor to discover something of its significance. The Swastika might have served:

I. As a symbol—

- 1, of a religion,
- 2, of a nation or people,
- 3, of a sect with peculiar tenets;

II. As an amulet or charm—

- 1, of good luck, or fortune, or long life,
- 2, of benediction, or blessing,
- 3, against the evil eye;

III. As an ornament or decoration.

It may have been (1) originally discovered or invented by a given people in a given country, and transmitted from one generation to the next, passing by migration from one country to another, and it may have been transmitted by communication to widely separated countries and among differently cultured peoples; or (2) it may have appeared in these latter countries by duplicate invention or by accident, and without contact or communication.

Positive evidence concerning its origin and earliest migration is not obtainable, and in its absence we are driven to secondary and circumstantial evidence. This will consist (1) of comparison of known facts directly concerning the subject; (2) of facts indirectly concerning it, and (3) reason, induced by argument, applied to these facts, presenting each truly, and giving to each its proper weight.

The possible migrations of the Swastika, and its appearance in widely separated countries and among differently cultured peoples, afford the principal interest in this subject to archæologists and anthropologists. The present or modern scientific interest in and investigation of the Swastika as a symbol or a charm alone are subsidiary to the greater question of the cause and manner of its appearance in different countries, whether it was by migration and contact or by independent invention. In arguing this question, we must keep continually in mind the rules of reason and of logic, and neither force the facts nor seek to explain them by unknown, imaginary, or impossible methods. There must be no dogmatic assertions nor fanciful theories. If we assume certain migrations of the Swastika, we must consider those things which might have (or must have) migrated with it; and we must admit the means necessary to the assumed end.

The history of the beginning and first appearance of any of the forms of the cross is also lost in antiquity, and it would be hazardous for any person to announce positively their origin, either as to locality

or time. The Swastika was certainly prehistoric in its origin. It was in extensive use during the existence of the third, fourth, and fifth cities of the site of ancient Troy, of the hill of Hissarlik; so also in the Bronze Age, apparently during its entire existence, throughout western Europe from the Mediterranean Sea to the Arctic Ocean. It continued in use in Europe during the Iron Age, and also among the Etruscans, Greeks, and Trojans. The name "Swastika," by which it is recognized to-day in all literature, is a Sanscrit word, and was in common use among the Sanscrit peoples so long ago that it had a peculiar or individual pronunciation in Pânini's grammar prior to the fourth century B. C. Some authorities are of the opinion that it was an Aryan symbol and used by the Aryan peoples before their dispersion through Asia and Europe. This is a fair subject for inquiry and might serve as an explanation how, either as a sacred symbol or charm, an amulet, or token of good wishes or good fortune, the Swastika might have been carried to the different peoples and countries in which we now find it by the splitting up of the Aryan peoples and their migrations and establishment in the various parts of Europe. Professor Sayce is of the opinion that the Swastika was a Hittite symbol and passed by communication to the Aryans or some of their important branches before their final dispersion took place, but he agrees that it was unknown in Assyria, Babylonia, Phenicia, or among the Egyptians.

Whether the Swastika was in use among the Chaldeans, Hittites, or the Aryans before or during their dispersion, or whether it was used by the Brahmins before the Buddhists came to India is, after all, but a matter of detail of its migrations; for it may be fairly contended that the Swastika was in use, more or less common among the people of the Bronze Age anterior to either the Chaldeans, Hittites, or the Aryans. The additional facts in this regard have been set forth in the chapter on this subject, and need not be repeated here.

The question should, so far as possible, be divested of speculation, and the evidence accepted in its ordinary meaning "without prejudice or preconceived opinion."

A consideration of the subject in the light of the material here collected develops the following questions:

- (1) Was the Swastika, in any of its forms, the symbol of an ancient religion or philosophy, or was it only the sign of a particular sect, tenet, faith, or idea; or was it both?
- (2) Was it a charm or amulet to be used by anyone which derived its value from the signification given to it?
- (3) What lesson can be gathered from it concerning the early migrations of the races of man?

Examples illustrating these questions are to be found in history as well as in everyday life. The Scarabæus of Egypt and Etruria was a symbol of eternity. The golden hoop on the lady's finger representing a snake swallowing its tail, is also a symbol of eternity. These

represent a sentiment, and are symbols of that sentiment without regard to sect or organized body.

On the other hand, the Maltese cross was the symbol of the Knights of Malta, and has become, in later years, that of the Masonic fraternity; while the three links is the symbol of the Order of Odd Fellows. The Latin cross is a symbol of the Christian religion and, to a certain extent, of a Christian denomination.

Upon the evidence submitted, we must accept the Swastika first as a symbol of that sect of Jains within the Buddhist Church originally in Tibet, which spread itself in the Asiatic country under the names of Tao-sse, Tirthankara, Ter, Musteg, and Pon or Pon-po, the last signifying purity (ante, p. 774). This sect, or these sects, adopted the Swastika as their symbol, giving it the translation *su* "well," *asti*, "it is," the whole word meaning "it is well," or "so be it," implying resignation under all circumstances, the sect holding, in accordance with the meaning given to their symbol, that contentment and peace of mind were the chief objects of human life. In so far as it concerns this sect, the Swastika was a symbol of both kinds. It represented a religious or at least a moral and philosophic idea, and also the sect which held to this idea.

Among the Buddhists proper, the Swastika seems to have been employed as a holy or sacred symbol; its occurrence as one of the signs in the footprint of Buddha, their founder, with some relation either to the mystery of his appearance as a leader, a missionary, or of the holy and sacred object of his mission, causes this to be inferred. Their use of it on the bronze statues of Buddha, and associating it with solemn inscriptions in the caves of India, leaves no doubt as to its use as a symbol more or less of this character.

Again, the use in the early Christian times of different forms of the cross, coupled with the extensive use by the Christians of the "monogram of Christ" (fig. 6), shows how naturally there may have been a conflict of opinion in the selection of a cross which should be a representative, while we know from history that there was such discussion, and that different forms of the cross were suggested. Among other forms was the Swastika, but to what extent or with what idea the author is not informed. The Swastika was used, Burnouf says, a thousand times on Christians' tombs in the catacombs at Rome. This is evidence of its use to a certain extent in a sacred or solemn and funereal character, which would signify its use as the symbol of a religious idea.

Beyond these instances the author is unable to find evidence of the Swastika having served as a symbol of any religious or philosophic idea or of any sect or organization.

Whether among the Bronze Age people of western Europe—among the Trojans, Greeks, or Etruscans—whether among the semicivilized peoples of South or Central America, or among the savages (mound-

builders) of North America, there is apparently no instance of the Swastika having been regarded as holy or used on a sacred object—that is, holy and sacred in the light of godliness, piety, or morality. It may have been or may yet be discovered that some of these wild men used the Swastika upon objects serving at ceremonies or festivals of their religion, or which had, in their eyes, a semi-sacred character. But it does not seem that it was used as a representative of a holy idea or of any god or supernatural being who stood for such an idea. The meal used in the Zuñi ceremony may have been regarded as sacred, and it may, indeed must, have been made on a stone metate, yet neither the metate nor the stone thereby obtained any holy or sacred character. So, also, it may have been decorated with a fret, chevron, herringbone, or any of the numerous styles, none of which would receive any sacred character from such use. So it is believed to have been with the Swastika found on these objects; it was not holy or sacred because of this use.

The author declines to discuss the possible relation of the Swastika to the sun or sun god, to the rain or rain god, the lightning, to Dyaus, Zeus or Agni, to Phebus or Apollo, or other of the mythological deities. This question would be interesting if it could be determined with certainty, or if the determination would be accepted by any considerable number of persons. But this is left for some one more competent and more interested than the author.

The most probable use of the Swastika among prehistoric peoples, or among Orientals other than the Buddhists, was as a charm or amulet signifying good fortune, good luck, long life, or benediction and blessing.¹ (See p. 780.)

Looking over the entire prehistoric world, we find the Swastika used on small and comparatively insignificant objects, those in common use, such as vases, pots, jugs, implements, tools, household goods and utensils, objects of the toilet, ornaments, etc., and infrequently on statues, altars, and the like. In Armenia it was found on bronze pins and buttons; in the Trojan cities on spindle-whorls; in Greece on pottery, on gold and bronze ornaments, and fibulæ. In the Bronze Age in western Europe, including Etruria, it is found on the common objects of life, such as pottery, the bronze fibulæ, ceintures, spindle-whorls, etc.

In addition to the foregoing, there were peculiar uses of the Swastika in certain localities: In Italy on the hut urns in which the ashes of the dead are buried; in the Swiss lakes stamped in the pottery; in Scandinavia on the weapons, swords, etc., and in Scotland and Ireland on the brooches and pins; in America on the metates for grinding corn; the Brazilian women wore it on the pottery fig leaf; the Pueblo Indian painted it on his dance rattle, while the North American Indian, at the epoch of the mound building in Arkansas and Missouri, painted it in spiral form on his pottery; in Tennessee he engraved it on the shell, and

¹ Goblet d'Alviella, "La Migration des Symboles," pp. 56, 57.

in Ohio cut it in its plainest normal form out of sheets of copper. So also among the modern Indians we find it employed on occasions of ceremony, as in the mountain chant by the Navajoes, and the war chant of the Kansas, on the necklace and ceremonial garters of the Sac woman, and on the war shields of the Pimas.

As we do not find it represented in America on aboriginal religious monuments, on ancient gods, idols, or other sacred or holy objects, we are justified in claiming that it was not here used as a religious symbol; while, as it is found only on trinkets, shells, copper plaques, spindle-whorls, metates, pottery bowls, jugs, bottles, or vases; as we find it sometimes square, sometimes spiral, now outside, now inside, of bowls and jars, etc.; at one time a small rectangular figure and at another of extensive convolutions covering the side of the vase; as we find it on the tools of the workmen, the objects in everyday use, whether in the house or the shop, used indiscriminately by men and women, or on gaming implements or dance rattles, the contention seems justifiable that it was used as an ornament or as a charm for good luck and not as a religious symbol. Yet we know it was used on certain ceremonial occasions which may themselves have had more or less a sacred character.

Thus, after the fullest examination, we find the Swastika was confined to the commoner uses, implements, household utensils, and objects for the toilet and personal decoration. The specimens of this kind number a hundred to one of a sacred kind. With this preponderance in favor of the common use, it would seem that, except among the Buddhists and early Christians, and the more or less sacred ceremonies of the North American Indians, all pretense of the holy or sacred character of the Swastika should be given up, and it should (still with these exceptions) be considered as a charm, amulet, token of good luck or good fortune, or as an ornament and for decoration.

VI.—THE MIGRATION OF SYMBOLS.

MIGRATION OF THE SWASTIKA.

The question of the migration of the Swastika and of the objects on which it was marked, which furnished its only means of transportation, remains to be considered. It is proposed to examine, in a cursory manner perhaps, not only the migration of the Swastika itself, but some of these objects, spindle whorls especially, with a view to discover by similarity or peculiarity of form or decoration any relationship they may have had with each other when found in distant countries and used by different peoples. Thus, we may be able to open the way to a consideration of the question whether this similarity of Swastikas or other decorations, or of the objects on which they were placed, resulted from the migration of or contact or communication between

distant peoples, or was it accidental and the result of independent discoveries and duplicate inventions—an evidence of the parallelism of human thought?

Dr. Brinton, in a communication before the American Philosophical Society,¹ starts out with a polemical discussion upon the subject of the migration of the Swastika and its possible American migration, as follows:

My intention is to combat the opinion of those writers who, like Dr. Hamy, M. Beauvois, and many others, assert that because certain well-known Oriental symbols, as the 'Ta Ki, the Triskeles, the Svastika, and the cross, are found among the American aborigines, they are evidence of Mongolian, Buddhistic, Christian, or Aryan immigrations previous to the discovery by Columbus, and I shall also try to show that the position is erroneous of those who, like William H. Holmes, of the Bureau of Ethnology, maintain "that it is impossible to give a satisfactory explanation of the religious significance of the cross as a religious symbol in America."

In opposition to both these views, I propose to show that the primary significance of all these widely extended symbols is quite clear, and that they can be shown to have arisen from certain fixed relations of man to his environment, the same everywhere, and hence suggesting the same graphic representations among tribes most divergent in location and race, and, therefore, that such symbols are of little value in tracing ethnic affinities or the currents of civilization.

I am sorry to be compelled to differ with Dr. Brinton in these views. I may not attempt much argument upon this branch of the subject, but whatever argument is presented will be in opposition to this view, as not being borne out by the evidence. Of course, the largest portion of the discussion of this subject must consist of theory and argument, but such facts as are known, when subjected to an analysis of reason, seem to produce a result contrary to that announced by Dr. Brinton.

It is conceded that the duplication of the cross by different or distant peoples is no evidence of migrations of or contact between these peoples, however close their relations might have been. The sign of the cross itself was so simple, consisting of only two marks or pieces intersecting each other at a right or other angle, that we may easily suppose it to have been the result of independent invention. The same conclusion has been argued with regard to the Swastika. But this is a *non sequitur*.

First, I dispute the proposition of fact that the Swastika is, like the cross, a simple design—one which would come to the mind of any person and would be easy to make. For evidence of this, I cite the fact that it is not in common use, that it is almost unknown among Christian peoples, that it is not included in any of the designs for, nor mentioned in any of the modern European or American works on, decoration, nor is it known to or practiced by artists or decorators of either country.² For the truth of this, I appeal to the experience of artists and decora-

¹ Proc. Am. Philosoph. Soc., xxvi, p. 177.

² For general lack of knowledge of Swastika in modern times, see Preface, p. 763.

tors, and would put the question whether, of their own knowledge, by their own inventions, they have ever discovered or made Swastikas, or whether their brother artists have done so, and if they answer in the affirmative, I would ask whether those cases were not rare. It may be granted that when the Swastika has been seen by an artist or decorator it is easily understood and not difficult to execute, but, nevertheless, I insist that its invention and use among artists and decorators during the centuries since the Renaissance is rare.

It is argued by Zmigrodzki that the Swastika on so many specimens, especially the Trojan spindle-whorls, having been made regularly, sometimes turning one way, sometimes another, sometimes square, other times curved, goes to show the rapidity with which the sign was made, that it did not require an artist, that its use was so common that it had become a habit and was executed in a rapid and sketchy manner, as evidenced by the appearance of the marks themselves upon the whorls. He likens this to the easy and unconsidered way which men have of signing their names, which they are able to do without attention. He likens it also to the sign of the cross made by Roman Catholics so rapidly as to be unnoticed by those who are unaware of its significance. With this line of argument, Zmigrodzki reasons that the Swastika was in its time confined to common use and thus he accounts for the number of ill-formed specimens. This only accounts for the comparatively few ill-formed specimens, but not for the great number, the mass of those well formed and well drawn. Instead of the Swastika being a sign easily made, the experience of the writer is the contrary. A simple cross like the Latin, Greek, St. Andrew's, and other common forms may be very easy to make, but a really good specimen of the Swastika is difficult to make. Any one who doubts this has only to make the experiment for himself, and make correctly such a specimen as fig. 9. While it may be easy enough to make the Greek cross with two lines of equal length intersecting each other at right angles, and while this forms a large proportion of the Swastikas, it is at its conclusion that the trouble of making a perfect Swastika begins. It will be found difficult, requiring care and attention, to make the projecting arms of equal length, to see that they are all at the same angle; and if it is bent again and again, two or three turns upon each other, the difficulty increases. If a person thinks that the Swastika, either in the square or the ogee curves or the spiral volutes, is easy to make, he has but to try it with paper and pencil, and, if that is his first attempt, he will soon be convinced of his error. The artist who drew the spirals for this paper pronounces them to be the most difficult of all; the curves are parabolic, no two portions of any one are in the same circle, the circle continually widens, and no two circles nor any two portions of the same circle have the same center. To keep these lines true and parallel, the curve regular, the distances the same, and at the same time sweeping outward in the spiral form, the artist pro-

nounces a most difficult work, requiring care, time, and attention (fig. 295). Even the square and meander Swastikas (figs. 10, 11) require a rule and angle to make them exact. All this goes to show the intention of the artist to have been more or less deliberate; and that the object he made was for a special purpose, with a particular idea, either as a symbol, charm, or ornament, and not a meaningless figure to fill a vacant space.

Yet it is practically this difficult form of the cross which appears to have spread itself through the widest culture areas, extending almost to the uttermost parts of the earth. All this is foundation for the suggestion that the Swastika was not the result of duplicate invention or independent discovery, that it is not an illustration of parallelism in human thought, but that it was transmitted from person to person, or passed from one country to another, either by the migration of its people, by their contact or communication, or by the migration and transmission of the symbol and the sign itself. Pushing the argument of the difficulty of its making, to account for the rarity of the design, it is alleged that in modern times the Swastika is practically unknown among Christian peoples. It passed out of use among them nigh a thousand years ago and has been supplanted by every other imaginable geometric form. The fret, chevron, herringbone, crosses, and circles of every kind, spirals, volutes, ogees, moldings, etc., have all remained in use since neolithic times, but no Swastika. The latest use mentioned in the literature upon this subject appears to have been in the arch-Episcopal chair in the cathedral at Milan, which bears the three ancient Christian crosses, the Latin cross, the monogram of Christ, and the Swastika, of which the first and last are carved in alternates around the pedestal of the chair. Yet the knowledge of the Swastika has been perpetuated in some countries and its use has not died out all over the world; therefore, examples of its use in modern times should be noted in order to prevent misapprehension and contradiction. The double Greek fret made with two continuous lines (fig. 139) forms a psuedo Swastika at each intersection, although we have seen that this is not a real but only an apparent Swastika (p. 783). This is used in modern times by carpet and linen weavers as borders for carpets and tablecloths, and by tile makers in similar decoration. The Swastika mark has continued in use among the Orientals; the Theosophists have adopted it as a seal or insignia; the Japanese (fig. 30), the Koreans (p. 799), the Chinese (fig. 31), the Jains (figs. 33, 34), and, among the North American Indians, the Navajo (pl. 17), and those of the Kansas Reservation (pls. 15 and 16). It is not used by European peoples in modern times, except in Lapland and Finland. The National Museum has lately received a collection of modern household and domestic utensils from Lapland, some of which bear the marks of the cross and one a churn, the lid of which bears a possible Swastika mark. Through the kindness of Professor Mason and Mr. Cushing, I have received a

drawing of this (fig. 344). Theodor Schvindt, in "Suomalaisia koristeita,"¹ a book of standard national Finnish patterns for the embroideries of the country, gives the Swastika among others; but it is classed among "oblique designs" and no mention is made of it as a Swastika or of any character corresponding to it. Its lines are always at angles of 45 degrees, and are continually referred to as "oblique designs."

The Swastika ornaments Danish baptismal fonts, and according to Mr. J. A. Hjal-talin it "was used [in Iceland] a few years since as a magic sign, but with an obscured or corrupted meaning." It arrived in that island in the ninth century A. D.²

The Swastika mark appears both in its normal and ogee form in the Persian carpets and rugs.³ While writing this memoir, I have found in the Persian rug in my own bedchamber sixteen figures of the Swastika. In the large rug in the chief clerk's office of the National Museum there are no less than twenty-seven figures of the Swastika. On a piece of imitation Persian carpet, with a heavy pile, made probably in

London, I found also figures of the Swastika. All the foregoing figures have been of the normal Swastika, the arms crossing each other and the ends turning at right angles, the lines being of equal thickness throughout. Some of them were bent to the right and some to the left. At the entrance of the Grand Opera House in Washington I saw a large India rug containing a number of ogee Swastikas; while the arms crossed each other at right angles, they curved, some to the right and some to the left, but all the lines increased in size, swelling in the middle of the curve, but finishing in a point. The modern Japanese wisteria workbaskets for ladies have

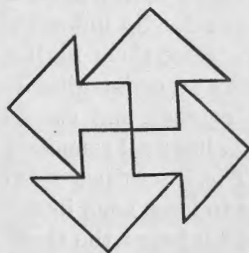


Fig. 344.

MODERN CHURN LID WITH DESIGN RESEMBLING SWASTIKA.

Lapland.

U. S. National Museum.

one or more Swastikas woven in their sides or covers.

Thus, it appears that the use of the Swastika in modern times is confined principally to Oriental and Scandinavian countries, countries which hold close relations to antiquity; that, in western Europe, where in ancient times the Swastika was most frequent, it has, during the last one or two thousand years, become extinct. And this in the countries which have led the world in culture.

If the Swastika was a symbol of a religion in India and migrated as such in times of antiquity to America, it was necessarily by human aid. The individuals who carried and taught it should have carried with it the religious idea it represented. To do this required a certain use of language, at least the name of the symbol. If the sign bore among the

¹Finnische Ornamente. 1. Stichornamente. Heft 1-4. Soumalaisen Kirjallisuuden Seura Helsingissä, 1894.

²Karl Blind, "Discovery of Odinic songs in Shetland," *Nineteenth Century*, June, 1879, p. 1098, cited by Alfred C. Haddon in "Evolution in Art," London, 1895, p. 285.

³Miss Fanny D. Bergen, in *Scribner's Magazine*, September, 1894.

aborigines in America the name it bore in India, Swastika, the evidence of contact and communication would be greatly strengthened. If the religion it represented in India should be found in America, the chain of evidence might be considered complete. But in order to make it so it will be necessary to show the existence of these names and this religion in the same locality or among the same people or their descendants as is found the sign. To find traces of the Buddhist religion associated with the sign of the Swastika among the Eskimo in Alaska might be no evidence of its prehistoric migration, for this might have occurred in modern times, as we know has happened with the Russian religion and the Christian cross. While to find the Buddhist religion and the Swastika symbol together in America, at a locality beyond the possibility of modern European or Asiatic contact, would be evidence of prehistoric migration yet it would seem to fix it at a period when, and from a country where, the two had been used together. If the Swastika and Buddhism migrated to America together it must have been since the establishment of the Buddhist religion, which is approximately fixed in the sixth century B. C. But there has not been as yet in America, certainly not in the localities where the Swastika has been found, any trace discovered of the Buddhist religion, nor of its concomitants of language, art, or custom. Adopting the theory of migration of the Swastika, we may therefore conclude that if the Swastika came from India or Eastern Asia, it came earlier than the sixth century B. C.

If a given religion with a given symbol, both belonging to the Old World, should both be found associated in the New World, it would be strong evidence in favor of Old World migration—certainly of contact and communication. Is it not equally strong evidence of contact to find the same sign used in both countries as a charm, with the same significance in both countries?

The argument has been made, and it has proved satisfactory, at least to the author, that throughout Asia and Europe, with the exception of the Buddhists and early Christians, the Swastika was used habitually as a sign or mark or charm, implying good luck, good fortune, long life, much pleasure, great success, or something similar. The makers and users of the Swastika in South and Central America, and among the mound builders of the savages of North America, having all passed away before the advent of history, it is not now, and never has been, possible for us to obtain from them a description of the meaning, use, or purpose for which the Swastika was employed by them. But, by the same line of reasoning that the proposition has been treated in the prehistoric countries of Europe and Asia, and which brought us to the conclusion that the Swastika was there used as a charm or token of good luck, or good fortune, or against the evil eye, we may surmise that the Swastika sign was used in America for much the same purpose. It was placed upon the same style of object in America as in Europe and Asia. It is not found on any of the ancient gods of America, nor

on any of the statues, monuments, or altars, nor upon any sacred place or object, but rather upon such objects as indicate the common and everyday use, and on which the Swastika, as a charm for good luck, would be most appropriate, while for a sacred character it would be singularly inappropriate.

The theory of independent invention has been invoked to account for the appearance of the Swastika in widely separated countries, but the author is more inclined to rely upon migration and imitation as the explanation.

When signs or symbols, myths or fables, habits or customs, utensils, implements or weapons, industries, tools or machinery, have been found in countries widely separated from each other, both in countries bearing characteristics so much alike as to make them practically the same objects or industries, and which are made in the same way, they present a question to which there are only two possible solutions: Either they are independent discoveries or inventions which, though analogous, have been separately conceived, or else they have been invented or discovered in one of the countries, and passed to the other by migration of the object or communication of the knowledge necessary to form it, or by contact between the two peoples. Of these inventions or discoveries said to have been made in duplicate, each of which is alleged to have sprung up in its own country as a characteristic of humanity and by virtue of a law of physics or psychology, it is but fair to say that in the opinion of the author the presumption is all against this. Duplicate inventions have been made and will be made again, but they are uncommon. They are not the rule, but rather the exception. The human intellect is formed on such unknown bases, is so uncertain in its methods, is swayed by such slight considerations, and arrives at so many different conclusions, that, with the manifold diversities of human needs and desires, the chances of duplicate invention by different persons in distant countries, without contact or communication between them, are almost as one to infinity.

The old adage or proverb says, "Many men of many minds," and it only emphasizes the differences between men in regard to the various phenomena mentioned. There are some things sure to happen, yet it is entirely uncertain as to the way they will happen. Nothing is more uncertain than the sex of a child yet to be born, yet every person has one chance out of two to foretell the result correctly. But of certain other premises, the chances of producing the same result are as one to infinity. Not only does the human intellect not produce the same conclusion from the same premises in different persons, but it does not in the same person at different times. It is unnecessary to multiply words over this, but illustrations can be given that are satisfactory. A battle, a street fight, any event happening in the presence of many witnesses, will never be seen in the same way by all of them; it will be reported differently by each one; each witness will have a different

story. The jurors in our country are chosen because of the absence of prejudice or bias. Their intellect or reason are intended to be subjected to precisely the same evidence and argument, and yet how many jurors disagree as to their verdict? We have but to consider the dissensions and differences developed in the jury room which are settled, sometimes by argument, by change of conviction, or by compromise. What would be the resources of obtaining justice if we were to insist upon unanimity of decision of the jury upon their first ballot or the first expression of their opinion and without opportunity of change? Yet these jurors have been charged, tried, and sworn a true verdict to render according to the law and evidence as submitted to them. There is no doubt but that they are endeavoring to fulfill their duty in this regard, and while the same evidence as to fact, and charge as to law, are presented to all of them at the same time, what different impressions are made and what different conclusions are produced in the minds of the different jurors. Illustrations of this exist in the decisions of our Supreme Court, wherein, after full argument and fair investigation, with ample opportunity for comparison of views, explanations, and arguments, all based upon the same state of facts, the same witnesses; yet, in how many cases do we find differences of opinion among the members of the court, and questions of the gravest import and of the most vital character settled for the whole nation by votes of 8 to 7 and 5 to 4? The author has examined, and in other places shown, the fallacy of the rule that like produces like. Like causes produce like effects is a law of nature, but when the decision rests upon the judgment of man and depends upon his reason and his intellect, our common knowledge testifies that this law has no application. When the proposition to be determined has to be submitted to individuals of widely separated and distinct countries between whom there has been neither communication nor contact, and who have received no suggestion as to their respective ideas or needs, or the means of satisfying them, it seems to the author that no rule can be predicated upon the similarity of human condition, of human reason, or of human intellect, certainly none which can be depended on to produce the same conclusion.

Consideration of the facility with which symbols, signs, myths, fables, stories, history, etc., are transmitted from one people to another and from one country to another, should not be omitted in this discussion. It may have slight relation to the Swastika to mention the migrations of the present time, but it will give an idea of the possibility of past times. In this regard we have but to consider the immense number of articles or objects in museums and collections, public and private, representing almost every country and people. We there find objects from all quarters of the globe, from the five continents, and all the islands of the sea. Some of them are of great antiquity, and it is a matter of wonderment how they should have made such long pas-

sages and have been preserved from destruction by the vicissitudes of time and space. We have but to consider how money passes from hand to hand and is always preserved to be passed on to the next. Every collection of importance throughout the world possesses a greater or less number of Greek and Roman coins antedating the Christian era. We have an excellent illustration of these possibilities in the word 'halloo,' commonly rendered as "hello." A few years ago this word, was peculiar to the English language, yet an incident lately occurred in the city of Washington, within sight of my own residence, by which this word, "hello," has traveled the world around, has spread itself over land and sea, has attached itself to and become part of most every spoken language of civilization, and without much consideration as to its meaning; but being on the procrustean bed of imitation, there are people, foreigners, who believe that the telephone can be only made to respond when the demand is made "hello!"

MIGRATION OF CLASSIC SYMBOLS.

Count Goblet d'Alviella, in "La Migration des Symboles," traces many ancient symbols from what he believes to be their place of origin to their modern habitat. The idea he elucidates in his book is indicated in its title.

The sacred tree of the Assyrians.—This he holds to be one of the oldest historic symbols; that it had its origin in Mesopotamia, one of the earliest civilized centers of the world. Beginning with its simplest form, the sacred tree grew into an ornate and highly complex pattern, invariably associated with religious subjects. Two living creatures always stand on either side, facing it and each other. First they were monsters, like winged bulls or griffins, and after became human or semihuman personages—priests or kings, usually in the attitude of devotion. The Count says the migration of both these types can be readily traced. The tree between the two monsters or animals passed from Mesopotamia to India, where it was employed by the Buddhists and Brahmans, and has continued in use in that country to the present time. It passed to the Phenicians, and from Asia Minor to Greece. From the Persians it was introduced to the Byzantines, and during the early ages, into Christian symbolism in Sicily and Italy, and even penetrated to the west of France. The other type—that is, the tree between two semi-human personages—followed the same route into India, China, and eastern Asia, and, being found in the ancient Mexican and Maya codices, it forms part of the evidence cited by the Count as a pre-Columbian communication between the Old World and the New. He argues this out by similarity of the details of attitude and expression of the human figure, the arrangement of the branches of the sacred tree, etc.

The sacred cone of Mesopotamia.—This was worshipped by the western Semites as their great goddess, under the image of a conical stone.

Its figurative representation is found alike on monuments, amulets, and coins. On some Phœnician monuments there is to be seen, super-added to the cone, a horizontal crossbar on the middle of which rests a handle. This shape bears a striking resemblance to the *Crux ansata* (fig. 4), and, like it, was a symbol of life in its widest and most abstract meaning. The resemblance between them is supposed to have caused them to have been mistaken and employed one for the other in the same character of symbol and talisman. It is alleged that the Ephesian Artemis was but the sacred cone of Mesopotamia anthropomorphized, although, with the halo added to Artemis, the allegation of relationship has been made in respect of the *Crux ansata*.

The Crux ansata, the key of life.—This is probably more widely known in modern times than any other Egyptian symbol. Its hieroglyphic name is *Ankh*, and its signification is “to live.” As an emblem of life, representing the male and female principle united, it is always borne in the hands of the gods, it is poured from a jar over the head of the king in a species of baptism, and it is laid symbolically on the lips of the mummy to revive it. From Egypt the *Crux ansata* spread first among the Phœnicians, and then throughout the whole Semitic world, from Sardinia to Susiana.

The winged globe.—This was a widely spread and highly venerated Egyptian symbol. From Egypt it spread, under various modifications, throughout the Old World. It is formed by a combination of the representations of the sun that have prevailed in different localities in Egypt, the mythology of which ended by becoming a solar drama. Two uræus snakes or asps, with heads erect, are twisted round a globe-shaped disk, behind which are the outstretched wings of a hawk, and on its top the horns of a goat. It commemorates the victory of the principle of light and good over that of darkness and evil. It spread readily among the Phœnicians, where it is found suspended over the sacred tree and the sacred cone, and was carried wheresoever their art was introduced—westward to Carthage, Sicily, Sardinia, and Cyprus, eastward to Western Asia. Very early it penetrated on the north to the Hittites, and when it reached Mesopotamia, in the time of Sargonidæ, the winged circle assumed the shape of the wheel or rosette, surmounted by a scroll with upcurled extremities and with a feathered tail opening out like a fan, or a human figure in an attitude sometimes of benediction, sometimes warlike, was inscribed within the disk. Then it was no longer exclusively a solar emblem, but served to express the general idea of divinity. From Mesopotamia it passed to Persia, principally in the anthropoid type. It was, however, never adopted by Greece, and it is nowhere met with in Europe, except, as before stated, in the Mediterranean islands. When Greece took over from Asia symbolic combinations in which it was originally represented, she replaced it by the thunderbolt. But the aureole, or halo,

which encircles the heads of her divinities, and which Christian art has borrowed from the classic, was directly derived from it.

The caduceus.—This is one of the interesting symbols of antiquity. It appears in many phases and is an excellent illustration of the migration of symbols. Its classic type held in the hand of Mercury and used to-day as a symbol of the healing art—a winged rod round which two serpents are symmetrically entwined—is due to the mythographers of later times, and is very remote from its primitive form. In the Homeric hymn it is called “the golden rod, three-petaled of happiness and wealth,” which Phœbus gave to the youthful Hermes, but on early Greek monuments the three leaves are represented by a disk surmounted by an incomplete circle. In this shape it constantly appears on Phœnician monuments; and at Carthage, where it seems to have been essentially a solar emblem, it is nearly always associated with the sacred cone. It is found on Hittite monuments, where it assumes the form of a globe surmounted by horns. Numerous origins and manifold antecedents have been attributed to it, such as an equivalent of the thunderbolt, a form of the sacred tree, or a combination of the solar globe with the lunar crescent. Some examples seem to indicate a transition from the sacred tree surmounted by the solar disk, to the form of the caduceus of the Hittites. Our author believes it was employed originally as a religious or military standard or flag; and that it was gradually modified by coming in contact with other symbols. Some Assyrian bas-reliefs display a military standard, sometimes consisting of a large ring placed upon a staff with two loose bandelets attached, sometimes of a winged globe similarly disposed. This Assyrian military standard may be the prototype of the labarum, which Constantine, after his conversion to Christianity, chose for his own standard, and which might equally well have been claimed by the sun worshipers. Under its latest transformation in Greece, a winged rod with two serpents twined round it, it has come down to our own times representing two of the functions of Hermes, more than ever in vogue among men, industry and commerce. It has survived in India under the form of two serpents entwined, probably introduced in the track of Alexander the Great. It was also met with in that country in earlier times in its simpler form, a disk surmounted by a crescent, resembling our astronomical sign for the planet Mercury. This earliest type of the caduceus, a disk surmounted by a crescent, appears at a remote date in India, and seems to have been confounded with the trisula.

The trisula.—This form of the trident peculiar to the Buddhists was of great importance in the symbolism of the Hindus; but whether it was an imitation of the type of thunderbolt seen on Assyrian sculptures, or was devised by them spontaneously, is uncertain. Its simplest form, which is, however, rarely met with, is an omicron (ω) surmounted by an omega (ω). Nearly always the upper portion is flanked by two small circles, or by two horizontal strokes which often take the appearance of

leaves or small wings. The points of the omega are generally changed into small circles, leaves, or trefoil; and the disk itself is placed on a pedestal. From its lower arc there fall two spires like serpents' tails with the ends curving, sometimes up and sometimes down. This is a very complex symbol. None of the Buddhist texts give any positive information in regard to its origin or meaning, and few symbols have given rise to more varied explanations. The upper part of the figure is frequently found separated from the lower; sometimes this is plainly a trident superposed upon a disk-shaped nucleus. The trident may possibly have symbolized the flash of lightning, as did Neptune's trident among the Greeks, but more probably it is the image of the solar radiation. Among the northern Buddhists it personifies the heaven of pure flame superposed upon the heaven of the sun. Though undoubtedly a Hindu emblem, its primitive shape seems to have early felt the influence of the caduceus, while its more complex forms exhibit a likeness to certain types of the winged globe. Still later the trisula was converted by Brahmanism into an anthropoid figure, and became the image of Jagenath. The vegetable kingdom was also laid under contribution, and the trisula came into a resemblance of the tree of knowledge. Although we have learned the probable signification of its factors in the creeds that preceded Buddhism, we know very little about its meaning in the religion that used it most, but it is a symbol before which millions have bowed in reverence. The plastic development of the trisula shows with what facility emblems of the most dissimilar origin may merge into each other when the opportunity of propinquity is given, and there is sufficient similarity in form and meaning.

The double-headed eagle on the escutcheon of Austria and Russia.—Count D'Alviella tells the history of the migration of the symbol of the double-headed eagle on the escutcheon of Austria and Russia. It was originally the type of the Garuda bird of southern India, found on temple sculptures, in carved wood, on embroideries, printed and woven cloths, and on amulets. It first appears on the so-called Hittite sculptures at Eyuk, the ancient Pteria in Phrygia: In 1217 it appeared on the coins and standards of the Turkoman conquerors of Asia Minor.

In 1227-28 the Emperor Frederick II undertook the sixth crusade, landing at Acre in the latter year, and being crowned King of Jerusalem in 1229. Within thirty years from these dates the symbol appeared on the coins of certain Flemish princes, and in 1345 it replaced the single-headed eagle on the armorial bearing of the holy Roman Empire. Thus, the historic evidence of the migration of this symbol, from the far east to the nations of the west by direct contact, would seem complete.

The lion rampant of Belgium.—This lion was incorporated into the Percy or Northumberland escutcheon by the marriage of Joceline of Louvain, the second son of Godfrey, the Duke of Brabant, to Agnes, the sister and heir of all the Percys. The Counts of Flanders, Brabant, and Louvain bore as their coat of arms the lion rampant facing to the left,

which is the present coat of arms of the King of Belgium. The story is thus told in Burke's "Peerage" (1895): Agnes de Percy married Joceline of Louvain, brother of Queen Adeliza, second wife of Henry I, and son of Godfrey Barbalus, Duke of Lower Brabant and Count of Brabant, who was descended from the Emperor Charlemagne. Her ladyship, it is stated, would only consent, however, to this great alliance upon condition that Joceline should adopt either the surname or arms of Percy, the former of which, says the old family tradition, he accordingly assumed, and retained his own paternal coat in order to perpetuate his claim to the principality of his father, should the elder line of the reigning duke become extinct. The matter is thus stated in the old pedigree at Sion House: "The ancient arms of Hainault this Lord Jocelyn retained, and gave his children the surname of Percy."

The migration of this lion rampant is interesting. It was in the twelfth century the coat of arms of the King of Albania. Phillippe d'Alsace, the eldest son of Thierry d'Alsace, was Count of Flanders, sixteenth in succession, tracing his ancestry back to 621 A. D. The original and ancient coat of arms of the Counts of Flanders consisted of a small shield in the center of a larger one, with a sunburst of six rays. Phillippe d'Alsace reigned as Count of Flanders and Brabant from 1168 to 1190 A. D. He held an important command in two crusades to the Holy Land. During a battle in one of these crusades, he killed the King of Albania in a hand-to-hand conflict, and carried off his shield with its escutcheon of the lion rampant, which Phillippe transferred to his own shield, took as his own coat of arms, and it has been since that time the coat of arms of the Counts of Flanders and Brabant, and is now that of Belgium. The lion in the escutcheon can thus be traced by direct historic evidence through Northumberland, Flanders and Louvain back to its original owner, the King of Albania, in the twelfth century. Thus is the migration of the symbol traced by communication and contact, and thus are shown the possibilities in this regard which go far toward invalidating, if they do not destroy, the presumption of separate invention in those cases wherein, because of our ignorance of the facts, we have invoked the rule of separate invention.

Greek art and architecture.—It has come to be almost a proverb in scientific investigation that we argue from the known to the unknown. We might argue from this proverb in favor of the migration of the Swastika symbol and its passage from one people to another by the illustration of the Greek fret, which is in appearance closely related to the Swastika; and, indeed, we might extend the illustration to all Greek architecture. It is a well-known fact, established by numberless historic evidences, that the Greek architecture of ancient times migrated—that is, passed by communication and contact of peoples, and by transfer of knowledge from one man to another, and from one generation to the succeeding generation, until it became known through-

out all western countries. The architects of Rome, Vicenza, Paris, London, Philadelphia, Washington, Chicago, and San Francisco derive their knowledge of Grecian architecture in its details of Doric, Ionic, and Corinthian styles by direct communication, either spoken, written or graphic, from the Greek architects who practiced, if they did not invent, these styles.

The Greek fret.—This has migrated in the same manner. As to its invention or origin, we have little to do in the present argument. Whether the fret was the ancestor or the descendant of the Swastika is of no moment to our present question. It has been demonstrated in the early part of this paper that both it and the Swastika had a common existence in early if not prehistoric Greece, and that both were employed in perfected form on the same specimen of Archaic Greek pottery. Figs. 133 and 134 demonstrate that these two signs migrated together from Greece to Egypt, for the particular specimen mentioned was found at Naukratis, Egypt. From this high antiquity the Greek fret has migrated to practically every country in the world, and has been employed during all historic time by the peoples of every civilization. The fret is known historically to have passed by means of teachers, either through speaking, writing, or drawing, and never yet a suggestion that its existence or appearance in distant countries depended upon separate invention or independent discovery.

Why strain at the gnat of independent invention of the Swastika when we are compelled to swallow the camel of migration when applied to the Greek fret and architecture? The same proposition of migration applies to Greek art, whether of sculpture, engraving, or gem carving. These ancient Grecian arts are as well known in all quarters of the civilized globe at the present day as they were in their own country, and this was all done by communication between peoples either through speaking, writing, or drawing. So far from being separate inventions, the modern sculptor or engraver, with full historic knowledge of the origin or, at least, antiquity of these arts, and with an opportunity for inspection and study of the specimens, is still unable to reproduce them or to invent original works of so high an order. The imaginary and newly invented theory that culture is the result of the psychologic nature of man manifesting itself in all epochs and countries, and among all peoples, by the evolution of some new discovery made to fit a human need—that as all human needs in a given stage are the same, therefore all human culture must, *per se*, pass through the same phases or stages—is a theory to which I refuse adhesion. It receives a hard blow when we take down the bars to the modern sculptor, requiring of him neither original invention nor independent discovery, but permitting him to use, study, adapt, and even servilely copy the great Greek art works, and we know that with all these opportunities and advantages he can not attain to their excellence, nor reach their stage of art culture.

VII.—PREHISTORIC OBJECTS ASSOCIATED WITH THE SWASTIKA,
FOUND IN BOTH HEMISPHERES, AND BELIEVED TO HAVE PASSED
BY MIGRATION.

SPINDLE-WHORLS.

Spindle-whorls are first to be considered. These are essentially prehistoric utensils, and are to be found in every part of the world where the inhabitants were sufficiently cultured to make twisted threads or cords, whether for hunting or fishing, games, textile fabrics, or coverings, either for themselves, their tents, or other purposes. In western Asia, all of Europe, in the pueblos of North America, and among the aborigines—by whatever name they are called—of Mexico, Central America, and the north and west coast of South America, wherever the aborigines employed cord, cloth, or fiber, the spindle-whorl is found. Where they used skins for the coverings of themselves or their tents, the spindle-whorl may not be found. Thus, in the Eskimo land, and among certain of the North American savages, spindle-whorls are rarely if ever found.

The spindle-whorl was equally in use in Europe and Asia during the Neolithic Age as in the Bronze Age. It continued in use among the peasants in remote and outlying districts into modern times. During the Neolithic Age its materials were stone and terra cotta; during the Bronze Age they were almost exclusively terra cotta. They are found of both materials. Recently a Gallo-Roman tomb was opened at Clermont-Ferrand and found to contain the skeleton of a young woman, and with it her spindles and whorls.¹

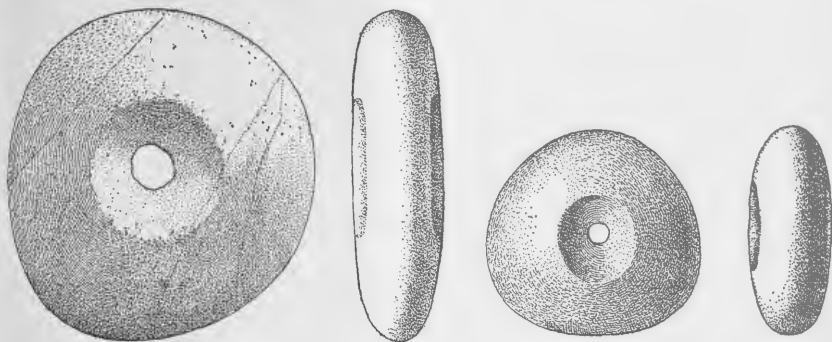
The existence of spindle-whorls in distant and widely separated countries affords a certain amount of presumptive evidence of migrations of peoples from one country to another, or of contact or communication between them. If the people did not themselves migrate and settle the new country, taking the spindle-whorls and other objects with them, then the spindle-whorl itself, or the knowledge of how to make and use it, must in some other way have gotten over to the new country.

This argument of migration, contact, or communication does not rest solely on the similarity of the whorls in the distant countries, but equally on the fact of spinning thread from the fiber; and this argument is reenforced by the similarity of the operation and of the tool or machine with which it was done. It has been said elsewhere that the probability of communication between widely separated peoples by migration or contact depended for its value as evidence, in some degree, upon the correspondence or similarity of the object considered, and that this value increased with the number of items of correspondence, the closeness of similarity, the extent of the occurrence, and the difficulty of its performance. So we pass to the similarity in size, appearance, mode of manufacture, and, finally, the use of the whorls of the two continents.

¹ Bull. Soc. d'Anthrop., Paris, October, 1893, p. 600.

EUROPE.

Switzerland—Lake dwellings.—Figs. 345 and 346 show stone spindle-whorls from prehistoric Swiss lake dwellings. These are in the U. S. National Museum, and with them are dozens of others of the same kind



Figs. 345 and 346.
STONE SPINDLE-WHORLS.
Neolithic.
Swiss lake dwellings.
U. S. National Museum.

and style from all other parts of Europe. Fig. 347 shows a stone spindle-whorl from Lund, Sweden. It is in the U. S. National Museum and was contributed by Professor Jillson. Figs. 348, 349, and 350 represent terra-cotta spindle-whorls from the Swiss lakes. These specimens were

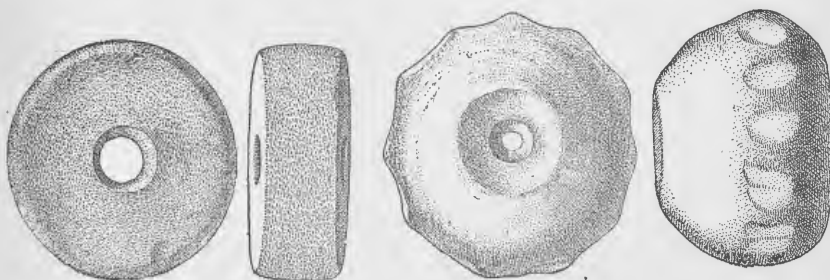


Fig. 347.
STONE SPINDLE-WHORL.
Neolithic.
Lund, Sweden.
Cat. No. 5281, U. S. N. M.

Fig. 348.
TERRA-COTTA SPINDLE-WHORL.
Neolithic or Bronze Age.
Swiss lake dwellings.
Cat. No. 100642, U. S. N. M.

selected to show the different patterns, to illustrate their unlikeness instead of their likeness, to give an understanding of the various kinds of whorls rather than that they were all one kind, a fad which should be kept in mind during this argument.

Italy.—Figs. 351, 352, and 353 show terra-cotta spindle-whorls from Orvieto, Italy, 78 miles north from Rome. Figs. 354 and 355 represent

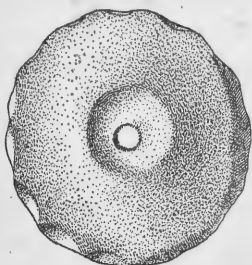


Fig. 349.

TERRA-COTTA SPINDLE-WHORL.

Neolithic or Bronze Age:

Swiss lake dwellings.

Cat. No. 100642, U. S. N. M.

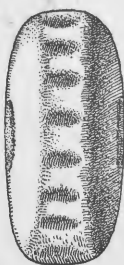
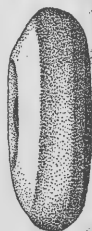


Fig. 350.

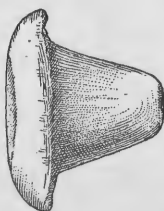
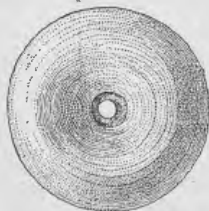
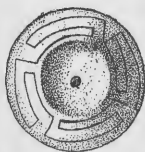
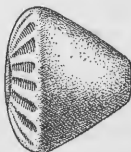
TERRA-COTTA SPINDLE-WHORL.

Swiss lake dwellings.

Cat. No. 100647, U. S. N. M.



spindle-whorls from Corneto, Italy, 63 miles north from Rome. As remarked above, they have been chosen to represent the different kinds.



Figs. 351, 352, and 353.

PREHISTORIC TERRA-COTTA SPINDLE-WHORLS.

Orvieto, Italy.

Cat. Nos. 101671, 101672, U. S. N. M.

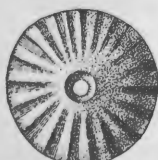
There are thousands of these whorls found in Italy. In the Archæological Exposition at

Turin, 1884, the number was so great that they were twined about the columns, thereby providing a place of storage as well as a place of display.

Wurtemberg.—Dr. Charles Rau procured for, and there is now in, the U. S. National Museum a spindle (fig. 356) with its whorl which had been in use for spinning from 1860 to 1870, and which

he obtained in Wurtemberg, Germany, from the woman who had used it.

France.—The author has seen the French peasants in Brittany spin-



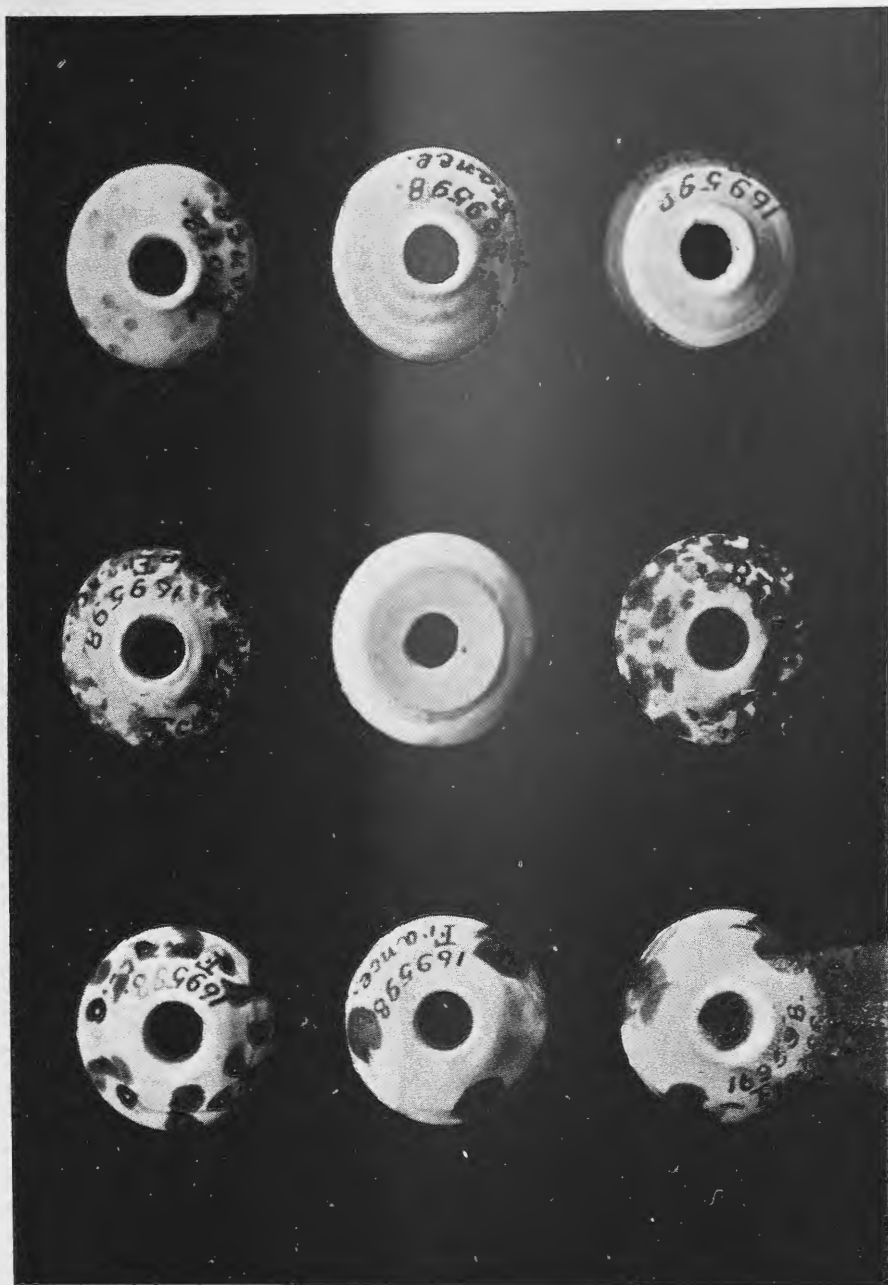
Figs. 354 and 355.

PREHISTORIC SPINDLE-WHORLS.

Corneto, Italy.

Cat. No. 10177, U. S. N. M.

ning their thread in the same way, and once took a photograph of one in the hamlet of Pout-Aven, Morbihan, but it failed in development,



SPINDLE-WHORLS OF MODERN PORCELAIN FROM SOUTHERN FRANCE.

Cat. No. 169598, U. S. N. M.

In 1893 Mr. Harle purchased at St. Gerons, Ardeche, a merchant's entire stock of modern porcelain spindle-whorls. The manufactory was located at Martres-Tolosane, and the trade extended throughout the Pyrenees. He presented a series to the Société d'Anthropologie at Paris, July, 1893.¹

The U. S. National Museum has lately received, through the kindness of the École d'Anthropologie, a series of nine of these porcelain whorls (pl. 21). The wheel and modern machines for spinning have penetrated this corner of the world, and these whorls are the last emblem of an industry dating slightly after the advent of man on earth and already old in that locality when Roland crossed the mountain pass near there and sounded his "Oliphant," calling for help from Charlemagne. These are the death chant of the industry of hand spinning in that country.

NORTH AMERICA—PRE-COLUMBIAN TIMES.

The North American Indians employed rushes and animal skins as the principal coverings for themselves and their tents. They used sinews and thongs for thread and cord, and thus avoided largely the necessity for spinning fiber or making textiles; for these or possibly other reasons, we find few spindle-whorls among them compared with the number found in Europe. Yet the North American Indians made and used textile fabrics, and there are pieces of woven cloth from mounds in Ohio now in the Department of Prehistoric Anthropology, U. S. National Museum. The Pueblo Indians spun thread and wove cloth in pre-Columbian times, and those within the States of Colorado and Utah and the adjoining Territories of Arizona and New Mexico, particularly the Navajoes, have been long noted for their excellence in producing textile fabrics. Specimens of their looms and thread are on display in the National Museum and have been published in the reports. Special attention is called to that by Dr. Washington Matthews in the Third Annual Report of the Bureau of Ethnology, 1881-82. Dr. Matthews is of the opinion that the work of the Pueblo Indians antedated that of the Navajoes, that the latter learned the art from the former since the advent of the Spaniards; and he remarks that the pupils now excel their masters in the beauty and quality of their work. He declares that the art of weaving has been carried to greater perfection among the Navajoes than among any native tribe in America north of the Mexican boundary; while with none in the entire continent has it been less influenced by contact with Europeans.



Fig. 356

MODERN SPINDLE AND
WHORL USED FOR SPIN-
NING THREAD.

Wurtemberg, Germany.

¹ Bull. Soc. d'Anthrop., Paris, pp. 461-462.

The superiority of the Navajo to the Pueblo work results not only from a constant advance of the weavers' art among the former, but from a deterioration of it among the latter. This deterioration among the Pueblo Indians he attributes to their contact with the whites, their inclination being to purchase rather than to make woven fabrics, while these influences seem not to have affected the Navajoës. He represents a Navajo woman spinning (see pl. 22 of the present paper). She is seated, and apparently whorls the spindle by rubbing it on her leg. The spindle is of wood, as are all other spindles, but the whorl is also of wood. In this these people are peculiar and perhaps unique. The whorl, among most other savage or prehistoric peoples, as we have already seen, was of stone or clay. These wooden whorls are thinner and larger, but otherwise they are the same. An



inspection of the plate will show that with it the spinning apparatus forms the same machine, accomplishes the same purpose, and does it in the same way. The sole difference is in the size and material of the whorl. The difference in material accounts for the difference in size. It is not improbable that the Indian discovered that the wooden

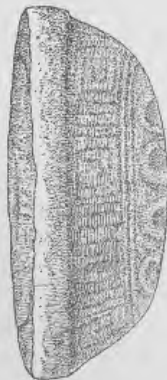


Fig. 357.

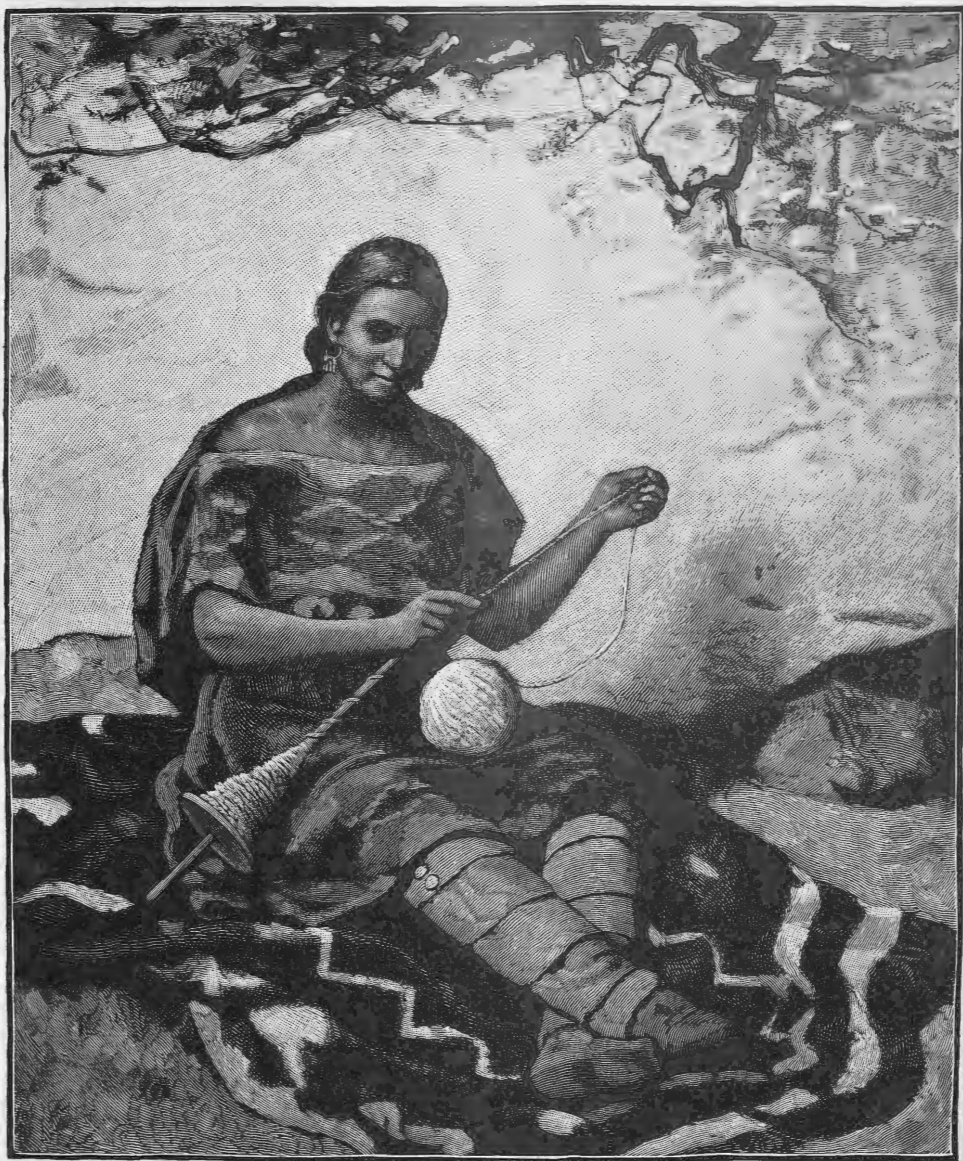
TERRA-COTTA SPINDLE-WHORL WITH DESIGN SIMILAR TO SWASTIKA.

Valley of Mexico.

Cat. No. 27875, U. S. N. M.

whorl would serve as well as a stone or pottery one, and that it was easier made. The machine in the hands of the woman, as shown in the figure, is larger than usual, which may be accounted for by the thread of wool fiber used by the Navajo being thicker and occupying more space than the flaxen thread of prehistoric times; so it may have been discovered that a large whorl of wood served their purpose better than a small one of stone. Stone whorls of large size might be too heavy. Thus may be explained the change from small stone or pottery whorls to large wooden ones.

Mexico.—Fig. 357 represents the two sides and edge of a pottery terra-cotta spindle-whorl. It is the largest of a series of six (Cat. Nos.



NAVAJO WOMAN USING SPINDLE AND WHORL.

Dr. Washington Matthews, Third Annual Report of the Bureau of Ethnology, 1881-82, Pl. xxxiv.

27875-27880) from the valley of Mexico, sent to the U. S. National Museum by the Mexican National Museum in 1877. Fig. 358 also represents one of a series from Mexico, obtained by W. W. Blake, July, 1886 (Cat. Nos. 99051-99059). The National Museum possesses hundreds of these from Mexico, as well as the small ones from Peru.

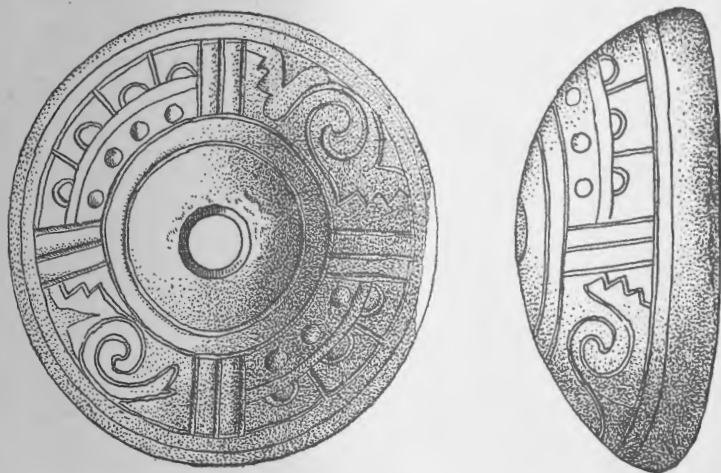


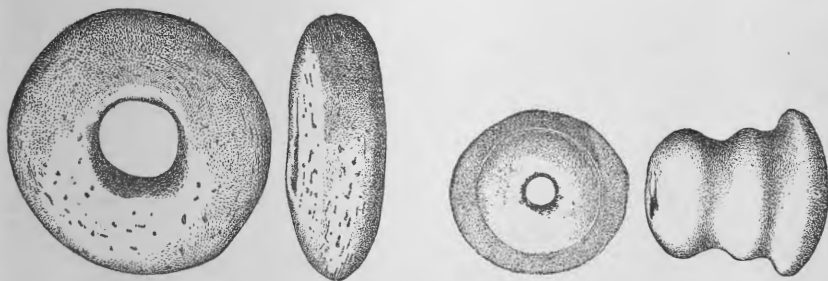
Fig. 358.

MEXICAN TERRA-COTTA SPINDLE-WHORL WITH DESIGN SIMILAR TO SWASTIKA.

These specimens are chosen because they are the largest and most elaborately decorated. It will be perceived at a glance how the style of decoration lends itself to the Swastika. It consists mostly of geometric figures, chief of which is the Greek fret, the labyrinth, the circle, and the volute, but as in the color stamps (pp. 946-947) there is no Swastika.

CENTRAL AMERICA.

Nicaragua.—The specimen shown in fig. 359, from Omotepe Island, Lake Nicaragua, is one of a series of pottery spindle-whorls, bearing,



Figs. 359 and 360.

TERRA-COTTA SPINDLE-WHORLS.

Omotepe Island, Nicaragua.

Cat. Nos. 28898, 28899, U. S. N. M.

however, great resemblance to those of stone. Fig. 360 shows a specimen from the same locality. It is of pottery and bears much resem-

blance in form to the earliest whorls found by Schliemann on the site of Troy on the hill of Hissarlik. Both these were collected by Dr. J. F. Bransford, and are in the U. S. National Museum. Fig. 361 shows a specimen from Granada, Nicaragua. It is of the common shape of the European prehistoric spindle-whorl. Its flat surface is decorated

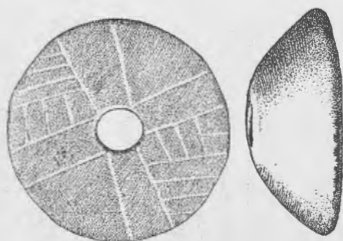


Fig. 361.

TERRA-COTTA SPINDLE-WHORL.

Granada, Nicaragua.

Cat. No. 23295, U. S. N. M.

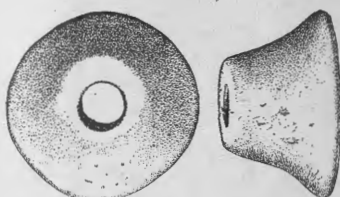


Fig. 362.

TERRA-COTTA SPINDLE-WHORL.

Malacate, Nicaragua.

Cat. No. 29609, U. S. N. M.

with a Greek cross in incised lines, two quarters of which are filled with hatch marks. Fig. 362 shows a terra-cotta spindle-whorl from Malacate, Nicaragua. It is cone-shaped. Both these specimens were collected by Dr. Earl Flint.

SOUTH AMERICA.

Chiriqui.—Figs. 363, 364, and 365 show terra-cotta spindle-whorls from Chiriqui, the most northern territory in South America and adjoining the Isthmus of Panama. They are engraved natural size, with ornamentation similar to that on the pottery of that country.

Colombia.—Fig. 366 shows a cone-shaped terra-cotta whorl from Manizales, Colombia, South America. It has a star-shaped design on the face and a three-line zigzag or chevron pattern.



Fig. 363.

SPINDLE-WHORL, MADE OF GRAY
CLAY AND DECORATED WITH
ANNULAR NODES.

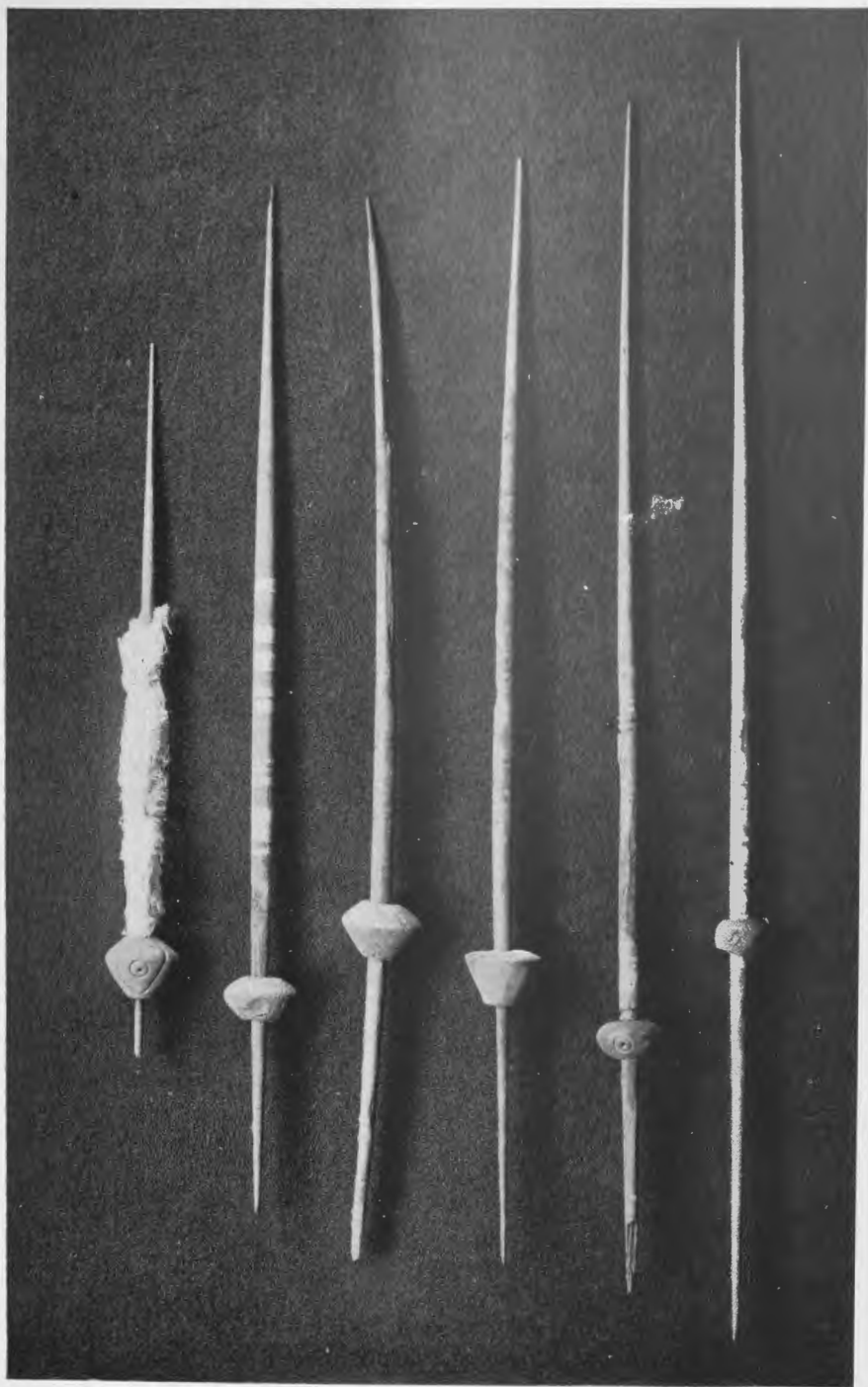
Chiriqui

Sixth Annual Report of the Bureau of Eth-
nology, fig. 218.

Peru.—Plate 23 represents a series of spindles and whorls from Peru. They were furnished to the U. S. National Museum by I. V. Norton, of Plainville, N. Y. The whorls were originally considered to be beads, and were without further description. The spindles were not inserted in them as at present. The spindles, as well as whorls, are exceedingly small. Some of the whorls are decorated by incised lines in the clay, and many of the spindles are

decorated in the middle with paint in different colors, in lines, scrolls, and chevrons. These are the only whorls from Peru which the U. S. National Museum has, though it possesses an extensive series of the spindles, several of which still have the spun thread wrapped upon them.

There are certain distinguishing peculiarities to be remarked when



SERIES OF ABORIGINAL SPINDLES AND WHORLS FROM PERU.
Cat. No. 17510, U. S. N. M.

comparing the spindle-whorls from the Western Hemisphere with those from the Eastern Hemisphere. There is greater diversity in size, form, and decoration in the American than in the European whorls. A series of European whorls from any given locality will afford a fair represen-

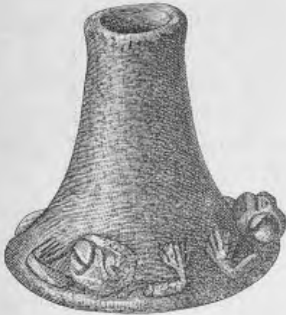


Fig. 364.

SPINDLE-WHORL OF GRAY CLAY WITH FIGURES OF ANIMALS.

Chiriqui.

Sixth Annual Report of the Bureau of Ethnology, fig. 219.



Fig. 365.

SPINDLE-WHORL OF DARK CLAY WITH PERFORATIONS AND INCISED ORNAMENTS.

Chiriqui.

Sixth Annual Report of the Bureau of Ethnology, fig. 220.

tation of those from almost every other locality. But it is different with the American specimens. Each section in America has a different style, not only different from the European specimens, but different from those of neighboring sections. Among the eighteen thousand whorls found by Dr. Schliemann on the hill of Hissarlik, there is

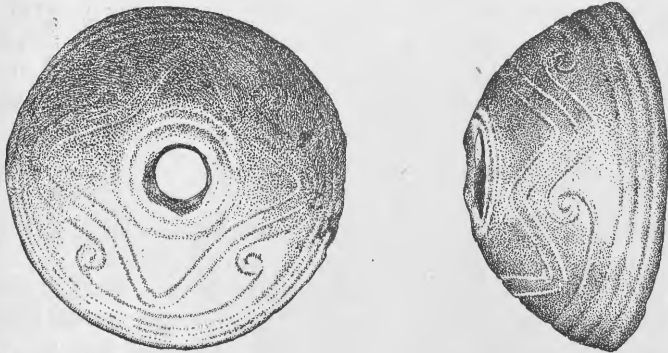


Fig. 366.

TERRA-COTTA SPINDLE-WHORL.

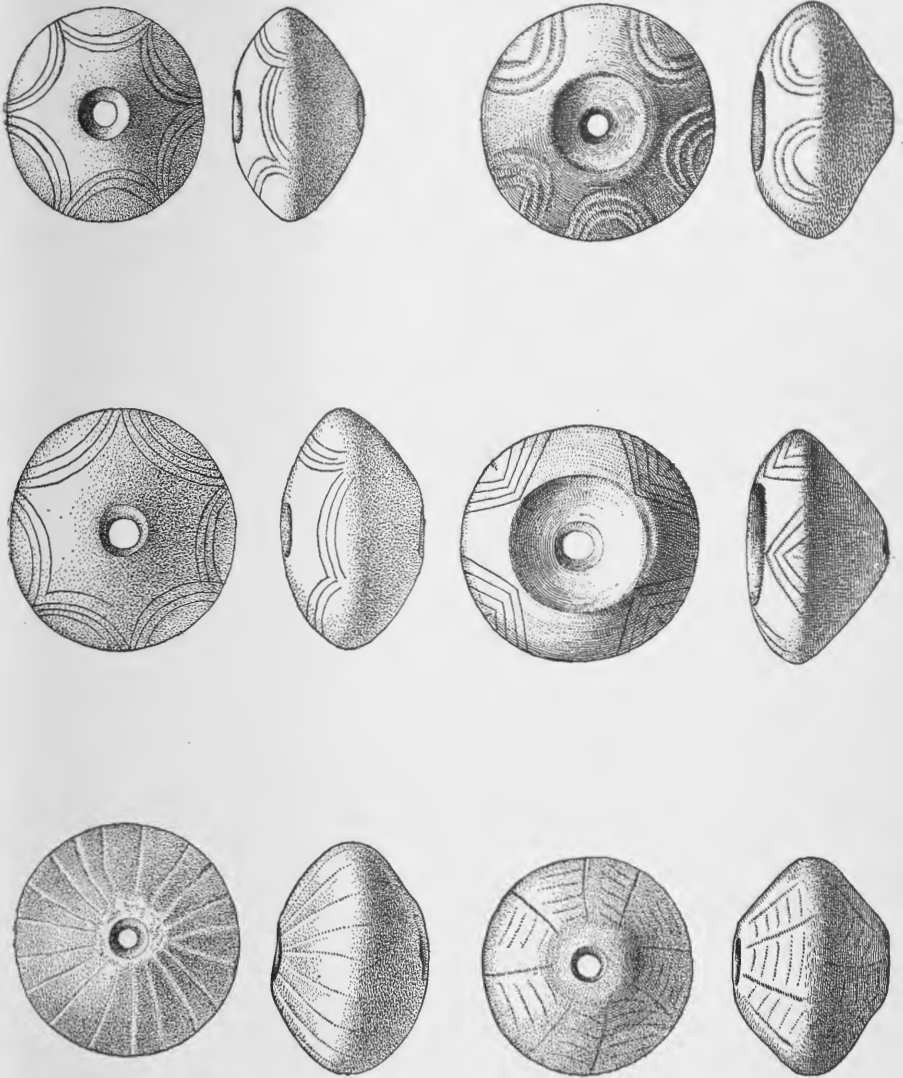
Manizales, Colombia.

Cat. No. 16838, U. S. N. M.

scarcely one so large as those here shown from Mexico, while, on the other hand, there were only a few as small as the largest of the series from Peru. The difference in size and material in the Pueblo whorls has already been noticed. The ornamentation is also peculiar in that it adopts, not a particular style common to the utensil, but that it

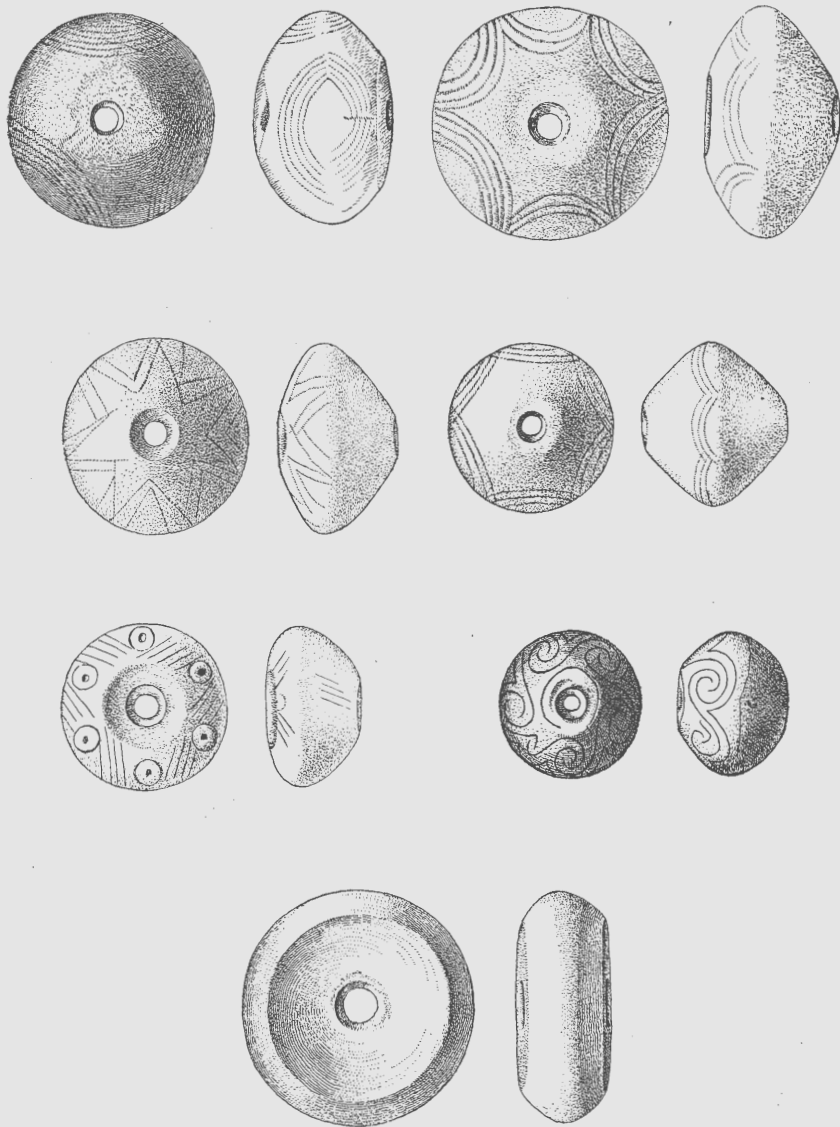
adopts the styles of the respective countries. The Mexican whorl has a Mexican style of ornamentation, etc. The Nicaragua specimens resemble the European more than any other from America in their forms and the almost entire absence of decoration.

The foregoing are the differences; but with all the number and extent of these differences the fact remains that the whorls of the two hemispheres are practically the same, and the differences are insignificant. In style, shape, and manner of use they are so similar in the two hemispheres as to be the same invention. The whorls, when put upon their spindles, form the same machine in both countries. They were intended for and they accomplish the same purpose, and the method of their performance is practically the same. While the similarity of the art of spinning and the mechanism (*i. e.*, the spindle and whorl) by which it is accomplished may not prove conclusively that it migrated from the Eastern Hemisphere, nor yet show positive connection or communication between the two peoples, it goes a long way toward establishing such migration or communication. The similarity in the art and its mechanism appears to the author to show such resemblance with the like culture in the Eastern Hemisphere, and is so harmonious with the theory of migration or contact or communication, that if there shall be other objects found which either by their number or condition would prove to be a well-authenticated instance of migration from or contact or communication between the countries, the evidence of the similarity of the spindle-whorls would form a valuable addition to and largely increase the evidence to establish the main fact. Until that piece of well-authenticated evidence has been obtained, the question must, so far as concerns spindle-whorls, remain only a probability. The differences between them are of manner, and not of matter; in size and degree, but not in kind, and are not other or greater than might easily arise from local adaptation of an imported invention. Compare the Navajo spindle (pl. 22) with that from Wurtemberg, Germany (fig. 356), and these with the spindles and whorls from Peru (pl. 23). These facts are entirely in harmony with the possibility that the spindle and whorl, as a machine for spinning, was a single invention, and that its slight differentiations resulted from its employment by different peoples—the result of its intertribal migrations. For purposes of comparison, and to show the similarity of these objects in Europe, the author has introduced a series of spindle-whorls from Troy, Hissarlik (pls. 24 and 25). These belong to the U. S. National Museum, and form part of the valuable collection from Mme. Schliemann, the gift by her talented husband to the people of the United States as a token of his remembrance and grateful feelings toward them.



SELECTED SPECIMENS OF SPINDLE-WHORLS FROM THE THIRD, FOURTH, AND FIFTH CITIES OF TROY.

U. S. National Museum.



SELECTED SPECIMENS OF SPINDLE-WHORLS FROM THE THIRD, FOURTH, AND FIFTH CITIES OF TROY.

BOBBINS.

EUROPE.

We have already seen how an increase in the number of correspondences between objects from distant countries increases the weight of their evidence in favor of contact or communication between the peoples. If it should be found upon comparison that the bobbins on which thread is to be wound, as well as the spindle-whorls with which it is made, had been in use during prehistoric times in the two hemispheres, it would add to the evidence of contact or communication. The U.

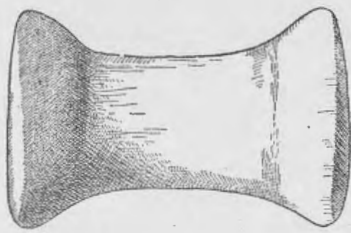
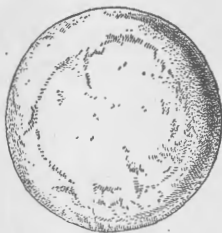


Fig. 367.

BOBBIN OR SPOOL FOR WINDING THREAD (?).

Type Villanova.

Corneto, Italy.

U. S. National Museum.

S. National Museum possesses a series of these bobbins, as they are believed to have been, running from large to small, comprising about one dozen specimens from Italy, one from Corneto and the others from Bologna, in which places many prehistoric spindle whorls have been found (figs. 367 and 368). These are of the type Villanova. The end as well as the side view is represented. The former is one of the largest, the latter of middle size, with others smaller forming a graduating series. The latter is engraved on the

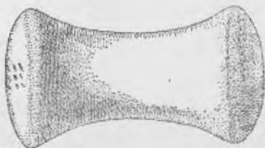
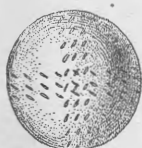


Fig. 368.

TERRA-COTTA BOBBIN OR SPOOL FOR WINDING
THREAD (?).

Type Villanova.

Bologna, Italy.

Cat. No. 101771, U. S. N. M.

The latter is engraved on the end by dotted incisions in three parallel lines arranged in the form of a Greek cross. A similar bobbin from Bologna bears the sign of the Swastika on its end (fig. 193).¹ It was found by Count Gozzadini and forms part of his collection in Bologna.

UNITED STATES.

The three following figures represent clay and stone bobbins, all from the State of Kentucky. Fig. 369 shows a bobbin elaborately decorated, from a mound near Maysville, Ky. It has a hole drilled longi-

¹ De Mortillet, "Musée Préhistorique," fig. 1239.

tudinally through the center. The end shows a cross of the Greek form with this hole in the center of the cross. Fig. 370 shows a similar object from Lexington, Ky., sent by the Kentucky University. It

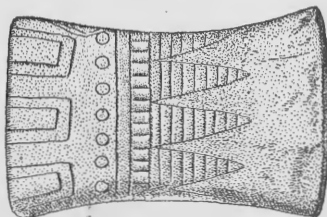
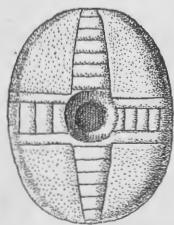


Fig. 369.

BOBBIN (?) FROM A MOUND NEAR MAYSVILLE, KENTUCKY.

Cat. No. 16748, U. S. N. M.

County, Ky. It is also drilled longitudinally, and is decorated with rows of zigzag lines as shown. The end view represents four consecutive pentagons laid one on top of the other, which increase in size as they go outward, the

hole through the bobbin being in the center of these pentagons, while the outside line is decorated with spikes or rays extending to the periphery of the bobbin, all of which is said to represent the sun. The specimen shown in fig. 372, of fine-grained sandstone, is from Maysville, Ky.



Fig. 370.

BOBBIN (?) FROM LEXINGTON, KENTUCKY.

Cat. No. 16691, U. S. N. M.

The two ends are here represented because of the peculiarity of the decoration. In the center is the hole, next to it is a rude form of Greek cross which on one end is repeated

as it goes farther from the center; on the other, the decoration consists of three concentric circles, one interval of which is divided by radiating lines at regular intervals, each forming a rectangle. Between the outer lines and the periphery are four radiating rays which, if completed all around, might form a sun symbol. Bobbins of clay have

been lately discovered in Florida by Mr Clarence B. Moore and noted by Professor Holmes.

Thus we find some of the same objects which in Europe were made

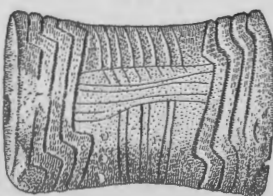


Fig. 371.

BOBBIN (?) OF FINE-GRAINED SANDSTONE.

Lewis County, Kentucky.

Cat. No. 29681, U. S. N. M.

and used by prehistoric man and which bore the Swastika mark have migrated to America, also in prehistoric times, where they were put to the same use and served the same purpose. This is certainly no inconsiderable testimony in favor of the migration of the sign.

VIII.—SIMILAR PREHISTORIC ARTS, INDUSTRIES, AND IMPLEMENTS IN EUROPE AND AMERICA AS EVIDENCE OF THE MIGRATION OF CULTURE.

The prehistoric objects described in the foregoing chapter are not the only ones common to both Europe and America. Related to the spindle-whorls and bobbins is the art of weaving, and it is perfectly susceptible of demonstration that this art was practiced in the two hemispheres in prehistoric times. Woven fabrics have been found

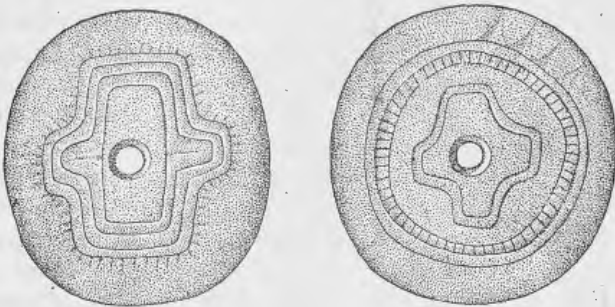


Fig. 372.

VIEW SHOWING BOTH ENDS OF A BOBBIN(?) OF FINE-GRAINED SANDSTONE.

Maysville, Kentucky.

Cat. No. 16747, U. S. N. M.

in the Swiss lake dwellings, in Scandinavia, and in nearly all parts of Europe. They belonged to the Neolithic and Bronze ages.

Figs. 373 and 374 illustrate textile fabrics in the Bronze Age. Both specimens are from Denmark, and the National Museum possesses another specimen (Cat. No. 136615) in all respects similar. While prehistoric looms may not have been found in Europe to be compared with the looms of modern savages in America, yet these specimens of cloth, with the hundreds of others found in the Swiss lake dwellings, afford the most indubitable proof of the use of the looms in both countries during prehistoric times.

Complementary to this, textile fabrics have been found in America, from the Pueblo country of Utah and Colorado, south through Mexico, Central and South America, and of necessity the looms with which they were made were there also. It is not meant to be said that the looms of the two hemispheres have been found, or that they or the textile fabrics are identical. The prehistoric looms have not been found in Europe, and those in America may have been affected by contact with the white man. Nor is it meant to be said that the textile fabrics of

the two hemispheres are alike in thread, stitch, or pattern. But these at best are only details. The great fact remains that the prehistoric man of the two hemispheres had the knowledge to spin fiber into thread, to wind it on bobbins, and to weave it into fabrics; and whatever differences there may have been in pattern, thread, or cloth, they were finally and substantially the same art, and so are likely to have been the product of the same invention.

While it is not the intention to continue this examination among the prehistoric objects of the two hemispheres in order to show their similarity and thus prove migration, contact, or communication, yet it may be well to mention some of them, leaving the argument or proof to a future occasion.

The polished stone hatchets of the two hemispheres are substantially the same. There are differences of material, of course, for in each country the workman was obliged to use such material as was obtainable. There are differences in form between the polished stone hatchets of the two hemispheres, but so there are differences between different localities in the same hemisphere. Some hatchets are long, others short, some round, others flat, some have a pointed end, others a square or nearly square or unfinished end; some are large, others small. But all these differences are to be found equally well pronounced within each hemisphere.

Scrapers have also been found in both hemispheres and in all ages. There are the same differences in material, form, and appearance as

in the polished stone hatchet. There is one difference to be mentioned of this utensil—*i. e.*, in America the scraper has been sometimes made with a stem and with notches near the base, after the manner of arrow-



Fig. 373.

WOMAN'S WOOLEN DRESS FOUND IN AN OAK COFFIN
AT BOBUM-ESHOI, DENMARK.

Bronze Age.

Report of the Smithsonian Institution (U. S. National Museum),
1892, pl. cr, fig. 2.

and spear-heads, evidently intended to aid, as in the arrow- and spear-head, in fastening the tool in its handle. This peculiarity is not found in Europe, or, if found, is extremely rare. It is considered that this may have been caused by the use of a broken arrow- or spear-head, which seems not to have been done in Europe. But this is still only a difference in detail, a difference slight and insignificant, one which occurs seldom and apparently growing out of peculiar and fortuitous conditions.

The art of drilling in stone was known over an extended area in prehistoric times, and we find innumerable examples which must have been performed in both hemispheres substantially in the same manner and with the same machine.

The art of sawing stone was alike practiced during prehistoric times in the two hemispheres. Many specimens have been found in the prehistoric deposits of both.

The aboriginal art of making pottery was also carried on in the same or a similar manner in both hemispheres. The examples of this art are as numerous as the leaves on the trees. There were differences in the manipulation and treatment, but the principal fact remains that the art was the same in both countries. Not only were the products greatly similar, but the same style of geometric decoration by incised lines is common to both. Greater progress in making pottery was made in the Western than in the Eastern Hemisphere during prehistoric times.

The wheel was unknown in both hemispheres, and in both the manipulation of clay was by hand. True, in the Western Hemisphere there was greater dexterity and a greater number of methods employed. For example, the vase might be built up with clay inside a basket, which served to give both form and decoration; it was coiled, the damp clay being made in a string and so built up by a circular movement, drawing the side in or out as the string of clay was laid thereon, until it reached the top; it may have been decorated by the pressure of a textile fabric, real or simulated, into the damp clay. A few years ago it would have been true to have said that pottery decorated in this manner was peculiar to the Western Hemisphere, and that it had never been found in the Eastern Hemisphere, but Prince Poutjatine has lately found on his property, Bologoje, in the province of Novgorod, midway between Moscow and St. Petersburg, many pieces of prehistoric pottery which bear evidence of having been made in this manner,

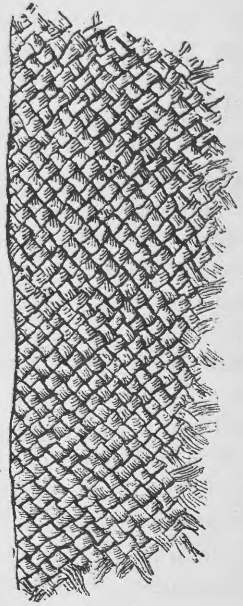


Fig. 374.

DETAIL OF DRESS SHOWN IN THE PRECEDING FIGURE.

and while it may be rare in the Eastern Hemisphere, it is similar in these respects to thousands of pieces of prehistoric pottery in North America.

One of the great puzzles for archæologists has been the prehistoric jade implements found in both countries. The raw material of which these were made has never been found in sufficient quantities to justify anyone in saying that it is indigenous to one hemisphere and not to the other. It may have been found in either hemisphere and exported to the other. But of this we have no evidence except the discovery in both of implements made of the same material. This material is dense and hard. It is extremely difficult to work, yet the operations of sawing, drilling, carving, and polishing appear to have been conducted in both hemispheres with such similarity as that the result is practically the same.

Prehistoric flint-chipping was also carried on in both hemispheres with such similarity of results, even when performing the most difficult and delicate operations, as to convince one that there must have been some communication between the two peoples who performed them.

The bow and arrow is fairly good evidence of prehistoric migration, because of the singularities of the form and the intricacies of the machinery, and because it is probably the earliest specimen of a machine of two separate parts, by the use of which a missile could be sent at a greater distance and with greater force than if thrown by hand. It is possible that the sling was invented as early as the bow and arrow, although both were prehistoric and their origin unknown.

The bow and arrow was the greatest of all human inventions—greatest in that it marked man's first step in mechanics, greatest in adaptation of means to the end, and as an invented machine it manifested in the most practical and marked manner the intellectual and reasoning power of man and his superiority over the brute creation. It, more than any other weapon, demonstrated the triumph of man over the brute, recognizing the limitations of human physical capacity in contests with the brute. With this machine, man first successfully made up for his deficiency in his contests with his enemies and the capture of his game. It is useless to ask anything of history about the beginnings of the bow and arrow; wherever history appears it records the prior existence, the almost universal presence, and the perfected use of the bow and arrow as a weapon. Yet this machine, so strange and curious, of such intricacy of manufacture and difficulty of successful performance, had with all its similarities and likenesses extended in prehistoric times almost throughout the then inhabited globe. It is useless to specify the time, for the bow and arrow existed earlier than any time of which we know; it is useless for us to specify places, for it was in use throughout the world wherever the world was occupied by neolithic man.

Imitative creature as was man, and slow and painful as were his steps in progress and in invention during his infancy on earth, when

he knew nothing and had everything yet to learn, it is sufficiently wonderful that he should have invented the bow and arrow as a projectile machine for his weapons; but it becomes doubly and trebly improbable that he should have made duplicate and independent inventions thereof in the different hemispheres. If we are to suppose this, why should we be restricted to a separate invention for each hemisphere, and why may we not suppose that he made a separate invention for each country or each distant tribe within the hemisphere? Yet we are met with the astonishing but, nevertheless, true proposition that throughout the entire world the bow and arrow existed in the early times mentioned, and was substantially the same machine, made in the same way, and serving the same purpose.

CONCLUSION.

The argument in this paper on the migration of arts or symbols, and with them of peoples in prehistoric times, is not intended to be exhaustive. At best it is only suggestive.

There is no direct evidence available by which the migration of symbols, arts, or peoples in prehistoric times can be proved, because the events are beyond the pale of history. Therefore we are, everybody is, driven to the secondary evidence of the similarity of conditions and products, and we can only subject them to our reason and at last determine the truth from the probabilities. In proportion as the probabilities of migration increase, it more nearly becomes a demonstrated fact. It appears to the author that the probabilities of the migration of the Swastika to America from the Old World is infinitely greater than that it was an independent invention.

The Swastika is found in America in such widely separated places, among such different civilizations, as much separated by time as by space, that if we have to depend on the theory of separate inventions to explain its introduction into America we must also depend upon the same theory for its introduction into the widely separated parts of America. The Swastika of the ancient mound builders of Ohio and Tennessee is similar in every respect, except material, to that of the modern Navajo and Pueblo Indian. Yet the Swastikas of Mississippi and Tennessee belong to the oldest civilization we know in America, while the Navajo and Pueblo Swastikas were made by men still living. A consideration of the conditions bring out these two curious facts: (1) That the Swastika had an existence in America prior to any historic knowledge we have of communication between the two hemispheres; but (2) we find it continued in America and used at the present day, while the knowledge of it has long since died out in Europe.

The author is not unaware of the new theories concerning the parallelism of human development by which it is contended that absolute uniformity of man's thoughts and actions, aims and methods, is produced when he is in the same degree of development, no matter in what country or in what epoch he lives. This theory has been pushed

until it has been said, nothing but geographical environment seems to modify the monotonous sameness of man's creations. The author does not accept this theory, yet he does not here controvert it. It may be true to a certain extent, but it surely has its limitations, and it is only applicable under special conditions. As a general proposition, it might apply to races and peoples but not to individuals. If it builds on the hereditary human instincts, it does not take into account the will, energy, and reasoning powers of man. Most of all, it leaves out the egoism of man and his selfish desire for power, improvement, and happiness, and all their effects, through the individual, on human progress. In the author's opinion the progress of peoples through consecutive stages of civilization is entirely compatible with his belief that knowledge of specific objects, the uses of material things, the performance of certain rites, the playing of certain games, the possession of certain myths and traditions, and the carrying on of certain industries, passed from one country to another by migration of their peoples, or by contact or communication between them; and that the knowledge, by separate peoples, of the same things, within reasonable bounds of similarity of action and purpose, and with corresponding difficulty of performance, may well be treated as evidence of such migration, contact, or communication. Sir John Lubbock expresses the author's belief when he says,¹ "There can be no doubt but that man originally crept over the earth's surface, little by little, year by year, just, for instance, as the weeds of Europe are now gradually but surely creeping over the surface of Australia." The word migration has been used by the author in any sense that permitted the people, or any number thereof, to pass from one country to another country, or from one section of a country to another section of the same country, by any means or in any numbers as they pleased or could.

The theory (in opposition to the foregoing) is growing in the United States that any similarity of culture between the two hemispheres is held to be proof of migration of peoples. It appears to the author that these schools both run to excess in propagating their respective theories, and that the true condition of affairs lies midway between them. That is to say, there was certain communication between the two hemispheres, as indicated by the similarities in culture and industry, the objects of which could scarcely have been the result of independent invention; while there are too many dissimilar arts, habits, customs, and modes of life belonging to one hemisphere only, not common to both, to permit us to say there was continuous communication between them. These dissimilarities were inventions of each hemisphere independent of the other.

An illustration of the migration to America is the culture of Greece. We know that Greek art and architecture enter into and form an important part of the culture of Americans of the present day; yet

¹ "Prehistoric Man," p. 601.

the people of America are not Greek, nor do they possess any considerable share of Greek culture or civilization. They have none of the blood of the Greeks, nor their physical traits, nor their manners, habits, customs, dress, religion, nor, indeed, anything except their sculpture and architecture. Now, there was undoubtedly communication between the two countries in so far as pertains to art and architecture; but it is equally true that there has been no migration of the other elements of civilization mentioned.

The same thing may be true with regard to the migrations of prehistoric civilization. There may have been communication between the countries by which such objects as the polished stone hatchet, the bow and arrow, the leaf-shaped implement, chipped arrow- and spear-heads, scrapers, spindle-whorls, the arts of pottery making, of weaving, of drilling and sawing stone, etc., passed from one to the other, and the same of the Swastika; yet these may all have been brought over in sporadic and isolated cases, importing simply the germ of their knowledge, leaving the industry to be independently worked out on this side. Certain manifestations of culture, dissimilar to those of the Old World, are found in America; we have the rude notched ax, the grooved ax, stemmed scraper, perforator, mortar and pestle, pipes, tubes, the ceremonial objects which are found here in such infinite varieties of shape and form, the metate, the painted pottery, etc., all of which belong to the American Indian civilization, but have no prototype in the prehistoric Old World. These things were never brought over by migration or otherwise. They are indigenous to America.

Objects common to both hemispheres exist in such numbers, of such infinite detail and difficulty of manufacture, that the probabilities of their migration or passage from one country to another is infinitely greater than that they were the result of independent invention. These common objects are not restricted to isolated cases. They are great in number and extensive in area. They have been the common tools and utensils such as might have belonged to every man, and no reason is known why they might not have been used by, and so represent, the millions of prehistoric individuals in either hemisphere. This great number of correspondences between the two hemispheres, and their similarity as to means and results is good evidence of migration, contact, or communication between the peoples; while the extent to which the common industries were carried in the two continents, their delicacy and difficulty of operation, completes the proof and forces conviction.

It is not to be understood in the few foregoing illustrations that the number is thereby exhausted, or that all have been noted which are within the knowledge of the author. These have been cited as illustrative of the proposition and indicating possibilities of the argument. If a completed argument in favor of prehistoric communication should be prepared, it would present many other illustrations. These could be found, not only among the objects of industry, utensils, etc., but in the modes of manufacture and of use which, owing to their number and the extent of territory which they cover, and the difficulty of accomplishment, would add force to the argument.

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