STATE OF INDIANA.

DEPARTMENT OF GEOLOGY AND NATURAL HISTORY.

JOHN COLLETT, STATE GEOLOGIST.

OFFICE AND STATE MUSEUM, CORNER OF MARKET AND TENNESSEE STREETS.

INTRODUCTION.

The Geological Survey.

What It has Accomplished in the Economic Interests of the State.

It is proper that some statements should be made as to the direct results of the workings of the geological department. One of the most important is the development of the vast Indiana coal fields. Before the initiation of the geological survey, Indiana coal was used only for blacksmithing and locally for fuel. The examinations made proved conclusively its purity and general good qualities, and also indicated the abundance of the supply. Reports were issued by State authority. They were read, believed and quoted. In this way the resources of the State were advertised to the world, and the attention of capitalists, miners and manufacturers was attracted. Before the survey, the coal lands of this State were worth from $2 to $10 per acre. They now sell readily at from $50 to $200 per acre, while Indiana coal is used to a very large extent by railroads and manufacturing establishments, and for household

purposes. Not only have its uses extended over our own State, but it finds a profitable market in our neighboring States, and extensive shipments are made as far west as the State of Kansas. The reports issued showing the good quality of our coal have either suggested or aided the construction of four or five important railroads, and prepared the way for others.

THE GREAT INCREASE IN VALUES.

Placing the average extent of counties included in the coal regions at 250,000 acres, the increased value of previously unproductive land would exceed $30,000,000, and adding the benefits derived from the setting up of forges, furnaces, factories and mills, and the building of railways, it is probably within the mark to state that the aggregate increase in values resulting from the development of the coal fields has reached $100,000,000. This great benefit to the State has been brought about to a very great extent, if not altogether, by the labors of the geological survey, and it should also be remembered in this connection that the money invested in operating our coal fields is largely foreign capital which has been brought within our reach for the purposes of taxation.

Such results alone represent more than a thousand per cent. profit on the cost of the survey. But many of the equally suggestive facts remain to be stated. The increased shipments from the town of Brazil, in Clay county, represent annually more money than the entire cost of the survey. Ten years ago a few car loads per annum constituted the entire export trade; and the same statement holds equally true in regard to the Washington mines, in Daviess county. The annual shipments are now from 250,000 to 300,000 tons, and the proprietors of mines are glad to arm themselves with analyses and letters from the State Geologist showing the purity and excellence of Indiana coal, by means of which they have built up an extensive shipping trade, while the cannel coal of Daviess county, by reason of its superiority as a grate fuel and for its illuminating qualities, now commands a full market in all directions outside of this State. The proprietors of coal mines are very frank to acknowledge the benefits derived from the geological survey.

There are 206 mines in nineteen counties of the State, employing 5,403 men, producing 2,500,000 tons of coal, requiring a capital of $1,600,000 for the present year.

THE BUILDING-STONE QUARRIES.

The fact that Indiana has more than two hundred square miles of the best building stone to be found in any Western State, if not in the world, has also been made known through the work of the Geological Department. This stone has been found in great variety of color and grade, and the tests applied have shown it to be of such enduring strength as to create a large demand. In this way another channel has been opened for the investment of large sums of money by Eastern capitalists, and many quarries are now being operated by skilled workmen, with the aid of the most approved machinery and tools. The product of these quarries, which a few years ago did not exceed $30,000 per annum, will, during the present year, amount to a very large sum. The citizens of Owen, Monroe, Lawrence, Washington, Harrison and other counties, fully appreciate the assistance they have received from the geological survey, and recognize that the prospect before them is that in the near future the increase of Indiana's wealth from her stone quarries will be equal to that resulting from the successful working of her coal mines.

NEW LINES OF RESEARCH.

If proper methods were adopted, nearly as good returns might be made from the sale of clays and other materials, which are at present almost unknown. The fine porcelain clay of Lawrence county, which was supposed at first to be confined to an area of about forty acres of profitable beds, is now found to extend over several hundred acres, and opens up a field for the introduction of the most extensive porcelain manufactories in the United States, since nowhere else is a clay found of such a pure white color and freedom from oxide of iron. Other States carefully test and report upon their medicinal springs and derive handsome revenues therefrom. The Indiana sulphur waters are equal, and in some respects superior, to any in the world. It would pay the State well to make them more widely known, as the effect would be to induce our own citizens to spend their money at home, and to bring extensive patronage from strangers for our railways, stage coaches, hotels, etc. Indiana could readily reap a profit of several hundred thousand dollars per annum from this source.

WHAT THE REPORTS HAVE ACCOMPLISHED.

The Geological Reports which have been published from time to time have gone over the whole land, and their accuracy has scarcely been questioned. The highest scientific authorities of this country and Europe have commended them as meritorious; while scientific journals, magazines, and newspapers of the Eastern States, England, Germany, and France have copied extracts with commendation. It has been charged that these reports are advertisements. The results show that they have been good advertisements, and that it pays Indiana well to advertise in that way. The State has done well in the past by advertising her resources, and will do still better by continuing it in the future. Indiana must show her attractions—must thrust her invitations into the hands of outsiders to enlist them in her army of productive citizens. We have room for millions. Our mines and quarries are only opened. Our forests offer the best of timber to the workers in wood. Our farm land is not half improved. We not only have room for emigrants, but we need their help.

The Ways and Means Committee's recommendation of an appropriation of $2,000 for salary, and $4,000 for expenses of the geological survey, would be a cost of less than $45 per county, or three cents to each of the two million inhabitants in the State.

Finally, the survey has been a good educator. It enables every one to understand the geology of his county, the minerals he can or can not find; saves useless and expensive search, and sends forth men so posted that some of the most profitable enterprises in other States have been begun and conducted by those who were Hoosier boys.

Experience has shown in every country and State the importance of having a permanent office of geology and natural history, with a director in charge who is able to give strangers and people at home accurate and official information on all subjects relating to the rocks, clays, coals, and all other minerals, especially those within the limits of his jurisdiction, and general information regarding the geological and mineralogical resources of all other portions of the United States. Indeed, it becomes a bureau stored with important information, to be furnished gratuitously to all who seek for counsel and advice

in matters within its range. Geology is a department of natural history that depends on investigation and developments for its progress. Evidences which tend to enrich science, that are not found to-day, may be found to-morrow, consequently the science is being daily promoted by new discoveries. The geological surveys of England, Scotland and Ireland have been in progress for at least fifty years, and still furnish new and important information to promote the welfare of the people. The same may be said of New York: while extensive field-work has been stopped, the venerable State Geologist, James Hall, from whose labors have evolved the fundamental nomenclature of geological epochs, which serve as a basis for American geology, still holds the office of State Geologist and finds plenty of work to do. Pennsylvania prosecuted an extensive survey under the able directorship of the late Henry D. Rogers, and then stopped, under the mistaken impression that his reports exhausted the subject. But it was soon discovered by wise statesmen that very much remained to be done, and the work was reinstated with J. Peter Lesley as director. He is aided by a large corps of assistants, and the work is being carried on with admirable detail and is alike creditable to science and the people of the State, whose welfare it has so greatly promoted. It is not for myself that I speak, when expressing the hope that the Legislature will see the wisdom of keeping alive the geological survey of Indiana, but for the people of the State, whose commercial welfare it has and will continue to promote.

Work of the Department.

The State Geologist in offering this, his third annual report (Thirteenth General Report), has pleasure in presenting to the citizens of Indiana the Geological Map of the State, which comprises more than one hundred years of the labors of himself, of his predecessors and their and his assistants, compiled upon a single sheet. This map will fill a want imperatively demanded *now* by students throughout the State and by scientists. The general outlines of the formations will be found to be correct, but future investigations may point out some minor changes to be made in their area.

He recurs with pleasure to the work of Prof. Leo Lesquereux on the "Principles of Vegetable Paleontology." This science is scattered through fifty different books of high price. Here, for the first time, it is gathered in a small space that will enable thousands to study a science heretofore accessible only to those who were able to purchase or obtain the use of expensive and rare works on the subject. He has here brought together the work and study of half a century in the space of a hundred pages. It is a triumph that Indiana gives this offering to science, and her sons and daughters should appreciate the work thus advantageously preserved.

The Fauna of the Coal Measures, by C. A. White, United States Paleontologist, presents the animal life of the Coal Measures, with his usual energy and fidelity.

These combined will enable the boys and girls of Indiana, as well as citizens, to *know* where coal is, and where it is not. Where these fossils exist coal may be expected. Where they do not exist coal can not be found. The rule is final and without appeal or variation. These papers and illustrations are found in Part II.

During the current year, 1883, surveys have been made by my assistants as follows: Morgan county, by Ryland T. Brown, M. D.; Rush county, by Moses N. Elrod, M. D.; Johnson county, by Rev. D. S. McCaslin; Grant county, by A. J. Phinny, M. D.

These surveys have been conducted with the characteristic care and fidelity of my assistants, to whom merited recognition and thanks are returned.

The State Geologist has continued his usual service. He has done the routine duties of his office, answering more than two thousand letters of inquiry, and given advice and opinions upon subjects of every branch of economic science, involving the investment sometimes of thousands of dollars, consuming hours and days of study. In addition he has been Chief of the Department, Office Assistant, Secretary, workman and errand boy.

Besides this, he has made field examinations in the Northwestern and Southern parts of the State, and made a detail survey of Posey county.

His time has been fully occupied, compelling a large amount of work outside of usual business hours.

The State museum has constantly increased. In silent work it instructs many of the fifteen thousand teachers and one hundred thousand students of the State. In Silurian, Devonian and Carboniferous fossils, and Archeological relics, it fairly rivals the favored collections of other States. It is valued by experts at over one hundred thousand dollars.

His term of office expires by law in April, 1885. He earnestly urges that such an office should be maintained and filled by a competent man, on whom citizens may call, without money or price, for information as to their mistakes or discoveries, and where those from abroad can obtain information of the wealth and resources of Indiana. This is believed to be more important to the State than additional field work or Paleontological descriptions and discoveries.

This office has, in the past, done much to advance the economic interests of the State. More can be done in the future.

By careful foresight on the part of the State Geologist, the last report was produced at a very low cost—less than $1 a volume. In other States such reports have cost from $2 to $15, averaging $4.80 a volume. The Department is proud of this re-

port, and the high favor and unqualified commendation it has received from scientists, not only at home and in our sister States, but also in Canada, England, Germany, Australia and other foreign countries. The demand for it has been sufficient to require a far larger number than the law limited the issue to. These reports, as well as those issued previously by this Department, embodying the careful and efficient work of my talented predecessors, are in great demand among scientists all over the world, and are already regarded as valuable geological works, and have now become rare and difficult to obtain.

They are not alone contributions to the science of the age, but enable the students and teachers of the State to gain access to valuable scientific knowledge at a nominal cost, while the library of a scientist will often cost from $10,000 to $20,000. It is believed that the State should continue this course until not only her geology is accessible to her sons and daughters, but, adhering to her duty to humanity and the advancement of knowledge and civilization, such reports shall also embody the botany, conchology and each branch of the vertebrate life of the State.

A comparison of the cost of surveys in Indiana with those of other States will show that the work has been performed here at a minimum. The Ohio Geological and Paleontological Reports cost $3.47 a volume. The Indiana Report of 1881, the most expensive yet produced, cost eighty cents per copy, while Illinois Paleontology cost about $3.00 per volume. Indiana, at a former session of the Legislature, appropriated $5,000 annually for geological surveys. Georgia appropriates $10,000 annually; New York, $25,000, and Pennsylvania, $50,000.

At the last session of the Legislature an appropriation of $5,000 per annum was reported, and passed both houses. Immediately, by telegraph, orders were given by me to complete work under negotiation, as was at the time necessary. By accident of legislation the general appropriation bill failed. The Chief of the Department was left without funds for expenses, with *mandatory duties*. He was *directed by law* "to continue the geological survey of the State by counties or districts, to give attention to the discovery of minerals, stone or other natural substances useful in agriculture, manufacture and the mechanical arts," and "to care for the geological cabinet, museum, apparatus and library, and their increase."

These duties, commanded by law, required the expenditure of cash funds. He has, by extra labor at his own hands, reduced these expenses to a minimum—below their real worth—which he has paid out of his private funds, and shall, at the next session of the Legislature, present an account for repayment. He expects that every citizen who is satisfied with his reports will, as a committee of one, see his Senator and Representative on the subject of repayment and making a permanent endowment for this department.

The quota of Geological Reports for each county are distributed through the respective County Auditors to citizens and township and public libraries, and by County Superintendents to teachers. No reports are sent except on receipt of twenty to twenty-five cents in stamps—the expense of mailing.

The following shows the financial exhibit for the year ending October 31, 1883, but it must be observed that this department has had no public funds for expenses since June, 1883, so that all work of assistants since that time has been paid by the State Geologist, in faith that future legislation will reimburse him.

FINANCIAL STATEMENT FOR THE YEAR ENDING OCT. 31, 1883.

STATE OF INDIANA,
DEPARTMENT OF GEOLOGY AND NATURAL HISTORY,
INDIANAPOLIS, IND., October 31, 1883.

To His Excellency ALBERT G. PORTER,
Governor of Indiana:

SIR: In pursuance of custom, I have the honor to submit the following "detailed statement, accompanied with the proper vouchers" (Nos. 75 to 115 inclusive) of and for all moneys expended during the fiscal year ending October 31, 1883.

AUDITOR'S VOUCHER, NO. 17.

1882.		
Nov. 4.	Voucher No. 75, Geo. K. Greene, for freight, etc. .	$4 29
Oct. 4.	Voucher No. 76, C. Gehring, for broom and mop.	1 00
Nov. 11.	Voucher No. 77, Am. Express, for expressage . .	1 15
Nov. 9.	Voucher No, 78, R. T. Brown, for Geological Report of Marion county	100 00

AUDITOR'S VOUCHER, NO. 17—*Continued.*

Nov. 21.	Voucher No. 79, C. E. Beecher, for clerical services	25 00	
Nov. 8.	Voucher No. 80, Geo. K. Greene, for one lot of fossils	4 30	
Oct. 31.	Voucher No. 81, R. T. Brown, for field work and Geological Report of Marion county	100 00	
Nov. 20.	Voucher No. 82, A. J. Phinney, for field work and writing Geological Report of Grant County	65 00	
Nov. 31.	Voucher No. 83, D. S. McCaslin, for Geological Survey of Jay county	50 00	
Nov. 31.	Voucher No. 84, John Collett, office expenses	9 05	
Nov. 21.	Voucher No. 85, C. E. Smith, for clerical services	5 00	
Nov. 30.	Voucher No. 86, G. K. Greene, for work in museum	65 00	
Nov. 30.	Salary of State Geologist for November	150 00	
			$579 79

AUDITOR'S VOUCHER, NO. 18.

Dec. 8.	Voucher No. 86½, George L. Curtis, for six plates of drawings	40 00	
Dec. 12.	Voucher No. 87, Dr. Chas. A. White, for descriptions and drawings coal measure fossil-fauna—part payment	300 00	
Dec. 15.	Voucher No. 88, Conrad Gehring, for office fixtures	1 85	
Dec. 25.	Voucher No. 89, J. A. Wildman, for postage stamps	20 00	
Dec. 27.	Voucher No. 90, W. De M. Hooper, for one lot of fossils	30 00	
Dec. 30.	Voucher No. 91, George K. Greene, for work in museum	65 00	
Dec. 30.	Voucher No. 92, William A. Green, for work in museum	18 00	
1883.			
Jan. 11.	Voucher No. 93, Leo Lesquereux, for balance on manuscript on Vegetable Palæontology	200 00	
Jan. 11.	Voucher No. 94, Chas. Reece, for painting doors.	7 00	
Jan. 11.	Voucher No. 95, W. B. Burford, printing and stationery	151 13	
Jan. 20.	Voucher No. 96, Moses N. Elrod, for survey and report of Decatur county	100 00	
Jan. 25.	Voucher No. 97, C. A. White, for descriptions and drawings coal measure fossil-fauna—part payment	392 00	
Jan. 31.	Voucher No. 98, William A. Green, for work in museum	42 00	
Jan. 31.	Voucher No. 99, George K. Greene, for work in museum	72 75	

AUDITOR'S VOUCHER, NO. 17—*Continued.*

1882.			
Dec. 27.	Voucher No. 100, W. B. Burford, for photo engraving	278 00	
Dec. 30.	Salary of State Geologist for December	150 00	
1883.			
Jan. 31.	Salary of State Geologist for January	150 00	
			2,017 73

AUDITOR'S VOUCHER, NO. 19.

	Voucher No. 101, Ketcham & Wannamaker, for altering geological map of Indiana	2 15	
Jan. 31.	Voucher No. 102, Lyman Simonton, for fossils	30 00	
	Voucher No. 103, Chas. A. White, for full payment	450 00	
Jan. 30.	Voucher No. 104, James Hall, for writing descriptions and arranging Vancleve corals and other work	300 00	
Jan. 25.	Voucher No. 105, E. Emmons, for drawings of fossils	15 00	
Jan. 25.	Voucher No. 106, Chas. E. Beecher, for clerical work	30 00	
Feb. 1.	Voucher No. 107, A. N. Taylor, for paper boxes	7 50	
Feb. 15.	Voucher No. 108, Van Benthuysen Printing House, for electrotype	4 75	
Feb. 16.	Voucher No. 110, John M. Coulter, for correcting proof	5 00	
Feb. 20.	Voucher No. 111, G. B. Simpson, for making drawings of fossils	25 00	
Feb. 27.	Voucher No. 112, W. De M. Hooper, for clerical services	66 25	
Feb. 14.	Voucher No. 113, John T. Campbell, for clerical services	30 00	
Feb. 28.	Voucher No. 114, John Collett, for express and office expenses	29 45	
Feb. 28.	Salary of State Geologist for February	150 00	
			1,145 10

AUDITOR'S VOUCHER, NO. 20.

Mar. 2.	Voucher No. 115, John Collett, for office expenses	$71 00	
	Salary of State Geologist for March	150 00	
			221 00

AUDITOR'S VOUCHER, NO. 21.

Apr. 10.	Voucher No. 116, John Collett, for office expenses	12 93
	Total of special appropriation for department exhausted April 10, 1883	$3,976 55

STATUTE APPROPRIATION.

Salary of State Geologist for April	$150 00	
Salary of State Geologist for May	150 00	
Salary of State Geologist for June	150 00	
Salary of State Geologist for July	150 00	
Salary of State Geologist for August	150 00	
Salary of State Geologist for September	150 00	
		$900 00
Grand total		$4,876 55

Respectfully submitted,

October 31, 1883. JOHN COLLETT, State Geologist.

OFFICE OF AUDITOR OF STATE.

This financial exhibit corresponds with the books in the office of the Auditor of State.

JAS. H. RICE,
Auditor of State.

July 19, 1884.

EXECUTIVE DEPARTMENT.

Filed June 28, 1884.

F. H. BLACKLEDGE,
Secretary.