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Growth and Development of the Present Division of Technology at Utah State Agricultural College

Lynn R. Willey

GROWTH AND DEVELOPMENT OF THE PRESENT DIVISION OF TECHNOLOGY AT UTAH STATE AGRICULTURAL COLLEGE

by

Lynn R. Willey

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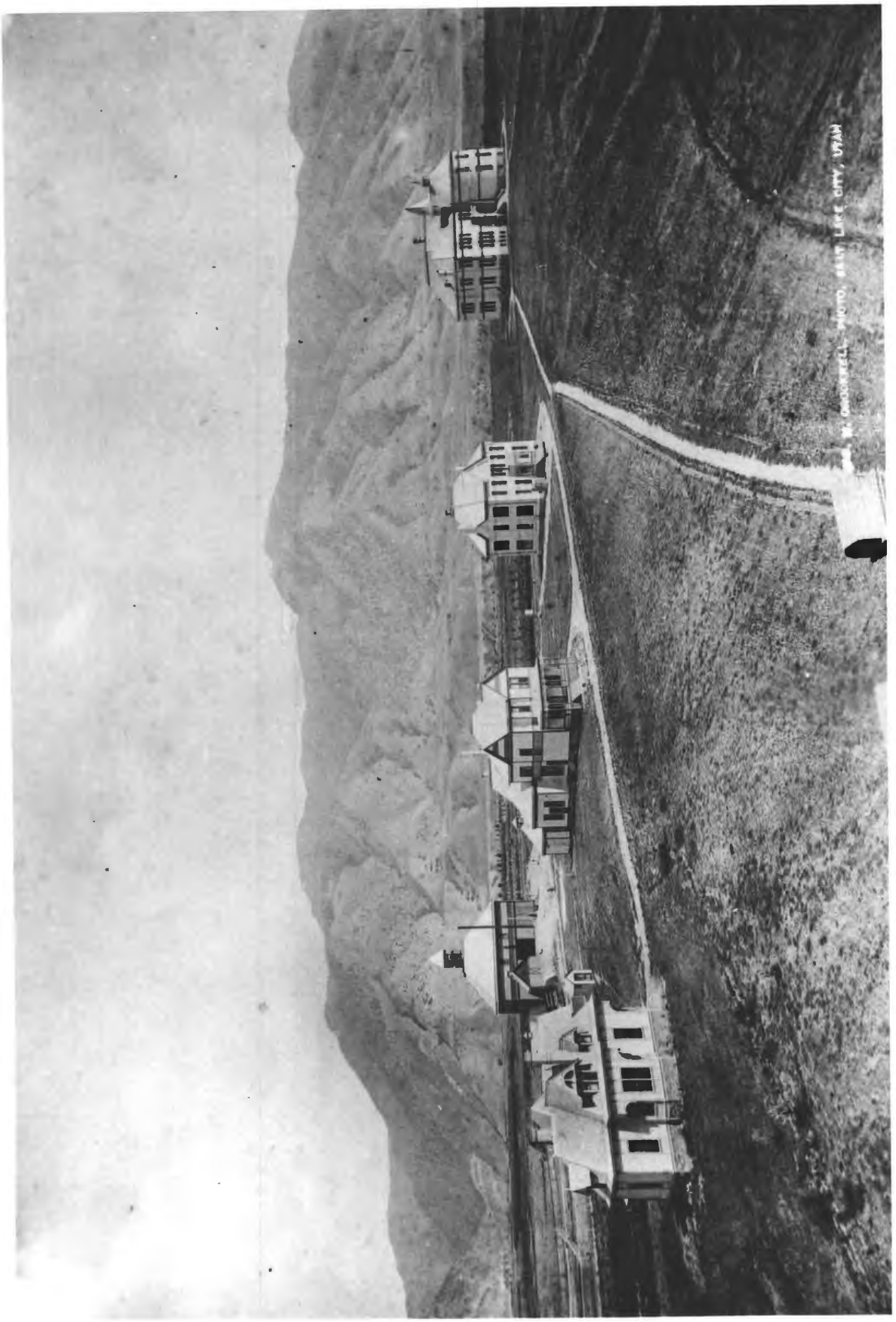

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INTRODUCTION

Statement of the Problem

This thesis traces the growth and development of the Division of Technology at the Utah State Agricultural College from 1890, when the first mechanic arts classes were taught as part of the offering in Mechanical Engineering, to the present, covering as thoroughly as possible from the source material available, the chain of events out of which the present expansive and complex program has evolved. The intention here is not merely to itemize the steps in this development, but wherever possible to investigate the influences involved; also, to give some attention to the industrial, education, and war-time needs that have created a demand for competently trained industrial personnel--needs which have been met by a constantly expanding educational and training program.

Since no comprehensive data are available on the development of what has now become a major division of the college, and since the need for such information will be felt by anyone making a future study of the growth of the division, it is hoped that this thesis will be useful. Thus, an intent of secondary importance is that the data made available here will prove useful to even more comprehensive studies. It is also hoped that the study may have some human interest as a sidelight on the history of the college.

Because the development of the industrial work at the college has been such a concrete symbol of the growth of the institution as a whole, and because the work shows so well the constant effort made over the years to keep the offerings of the school on as pragmatic a basis as possible, the author has felt that a rather complete and accurate record

of this progress should be made. One of the principal reasons for writing this thesis has been to give a comprehensive survey of the illuminating growth of the industrial work and its contribution to the educational offering of the college. It is hoped that the planning of the future course of the Division of Technology will be aided by a closer understanding of what has been accomplished in the past. It appears obvious to the author that such an understanding will also make the importance of the work that has been done readily apparent to anyone. A branch of education that has expanded so rapidly, often ingeniously, to keep pace with the needs of our modern industrial period readily justifies the recording of its own history. Finally, such a record can hardly fail to be an inspiration to anyone connected with the work or to anyone with an appreciation for demonstrable values and accomplishments.

Review of Source Material

Source material for the preliminary survey of the history of industrial education in America is plentiful and interesting. Charles A. Bennett, in his History of Manual and Industrial Education up to 1870, makes a thorough and comprehensive study of the movement from earliest times. This work along with Lewis F. Anderson's History of Manual and Industrial School Education (the first of its kind), R. J. Forbes' rather sketchy Man the Maker, and the definitive work of the U. S. Department of Interior's Survey of Land-Grant Colleges and Universities, would be sufficient for a most thorough survey of this significant movement. Other helpful books are also available, one of them by W. J. Kerr (a former president of the college), The Spirit of the Land-Grant Institutions.

Several theses dealing with rather closely related material have

been written at different institutions throughout the country, and from them certain bibliographical data and suggestions as to procedure were to be had, though in the main these theses were not particularly helpful.

No work whatsoever has been done on the subject at this college, except for what is included in J. E. Ricks' A History of Fifty Years, which includes occasional references to the personnel and work of the division. No theses have been written on the subject, and most of the source material regarding the actual development of the division has come from Biennial Reports of the Board of Trustees, the college catalogues, a few copies of the Student Life, and personal letters, largely those of the various directors of the division to the various presidents of the college. Considerable information has come from the two men longest associated with the division, Professors Emeritus Aaron Newey and D. A. Swenson. One of the most helpful sources has been the records and letters of former Dean of Engineering, George D. Clyde.

INDUSTRIAL EDUCATION IN AMERICA

No one can say precisely when industrial education began in America, but it is a natural outgrowth of the vast industrial expansion of the early part of the nineteenth century. At that time a vast group of people rose to prominence whose educational needs were far removed from the traditional and classical pattern of education. According to W. J. Kerr, "The real beginnings of agriculture and engineering as subjects of thought and study in America were made under the spur of industrial independence in the patriotic period following the Revolution and the War of 1812."[1] The demand was for scientific information that would increase production in agriculture and manufacturing. To this end Congress was stirred with petitions, memorials, and reports, all pointing to the need for a new kind of education. As a result, at least one schools was established by 1823 that dedicated itself to the demands of agriculture.

Historians who have traced the development of industrial thought from earliest times generally agree that there have always been two kinds of education: ". . . education for the manual laborer through practice with tools, implements, and machines in shop, field, ship, or mine, and education of brain-workers and members of the leisure class in the school, largely with the aid of books."[2] The necessity for stressing the practical side of education became apparent from the shifting pattern of

1. W. J. Kerr, The Spirit of the Land Grant Institutions. p. 8.
2. Lewis F. Anderson, History of Manual and Industrial School Education. Preface.

society in America between 1820 and 1870, with the complete reorganization of industrial conditions in the country.

> The percentage of people engaged in agriculture dropped from 82 to less than 48, while the percentage of those engaged in manufacturing, trades, and transportation increased from 17 to more than 31. In addition, a new class, called the personal service group, grew to embrace 18 percent of the workers, and the professional group expanded from an almost negligible number to 3 per cent.[3]

Established institutions were not able to cope with the new conditions. And because even the industrial classes were so closely associated with agriculture during the period before the Civil War, most of the initial agitation was for organizing agricultural colleges, a movement which gave rise to the land-grant college idea.

Land-Grant Colleges

The idea of land-grant institutions, state controlled and supported by taxation rather than endowments, began about the middle of the last century with the realization that the development of the nation depended upon the higher education of the masses, and with the obvious fact that traditional colleges and universities made no provision for the scientific, technical, and practical education of the vast majority of people who were engaged in trades and industry. The new type of school would need to provide instruction in both the liberal and practical arts.[4]

The resolutions of the Farmers' Convention of the State of Illinois in 1852 became a "Bill of Rights" in the education of the working man. The resolutions asked for the same privileges for the industrial as for the cultures or professional classes. They called for new institutions[5]

3. W. J. Kerr, op. cit., p. 9.
4. Cf. U. S. Off. of Ed. Bul. 1930, No. 9. p. 1.
5. W. J. Kerr, op. cit., p. 10.

to meet the needs of the industrial classes and specifically suggested the establishment of a university in Illinois for this purpose. The spirit of the land-grant institutions, according to Kerr, was chiefly the product of conditions of the first half of the century, with its frontier society, its new awakenings, and its realization that the education of the time "had no relation to the resources of the country or to the occupations and objectives of the great mass of the people."[6]

The Morrill Act (1862). "Under the impetus of the Morrill Act the period from about 1860 to 1885 became the great developing epoch of American education."[7] The first Morrill Act, which made the land-grant college a reality, "provided for the establishment of the most comprehensive system of scientific, technical, and practical higher education the world has ever known."[8]

In order to reach the masses of the people throughout the country, it was considered necessary to establish at least one land-grant college in every state. This end was accomplished with minimum opposition, particularly since many private institutions and already established state colleges and universities were willing to become land-grant institutions in order to receive federal aid. As a result, departments of agriculture and mechanic arts soon developed throughout the nation. These land-grant institutions brought a sweeping new spirit to education. "(1) The spirit of initiative--pioneering; (2) The spirit of growth--progress; (3) The spirit of equal opportunity for all--democracy; (4) The spirit of helpfulness--service."[9]

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6. W. J. Kerr, op. cit., p. 8.
7. Ibid., p. 11.
8. U. S. Off. of Ed. Bul. 1930, No. 9. p. 8.
9. W. J. Kerr, op. cit., p. 12.

Manual training and mechanic arts. The "mechanic arts," interpreted broadly to include engineering, and generally coordinated with courses in agriculture, became a required part of the program in all land-grant institutions in the early years of the Morrill Act.[10] Mechanic arts instruction consisted mainly of shop work of secondary grade, and written information on the subject was scarce. In fact, one of the chief difficulties facing early instructors was the fact that no suitable body of scientific, technical, and practical knowledge existed. Thus, at best, many institutions with the intention of serving the industrial and agricultural classes in a practical sense, were forced to remain merely trade schools in agriculture and mechanic arts, supplementing classical instruction and accumulating a body of useful knowledge as best they could.

The first great American champion of manual training was Calvin Milton Woodward, dean of the Polytechnic faculty of Washington University. In 1868 he was authorized to organize an engineering department for the university, for he had had wide experience with evening courses designed to help young men preparing to be engineers. One of his first, and most alarming, discoveries was that students did not know how to use the tools that he himself had used all his life. He immediately began instruction in the use of carpenter's and mechanic's tools, perhaps the first shopwork teaching of its kind in the country, since it had no trade or industrial motive. That appeared shortly afterward.

By 1871 the university boasted a fitted workshop, with a lathe, a workbench full of carpenter's tools, and other necessities for the acquiring of dexterity in the use of tools. A year later Professor Woodward had

10. U. S. Off. of Ed. Bul. op. cit., p. 844.

developed many new ideas and was suggesting that similar work to his be carried out in the common schools:

> But the acquisition of this desirable manual skill requires workshops and tools and teachers; and as such essentials are not in general to be had at home or at school, the work must be done at a polytechnic school. Hence, at the earliest possible moment, in the lowest class, students must enter the workshop. From the bench of the carpenter, they should go to the lathe. Wood turning is an art requiring great judgment and skill and after wood comes brass, iron, and steel turning, fitting and finishing; then the forge, where each should learn welding and tempering. This is the alphabet of tools. Next will come their legitimate use in the manufacture of patterns for castings, in the construction of model frames, trusses, bridges and roofs; in the cutting of screws and nuts with threads of various pitch; and in the manufacture of spur and bevel wheels, with equicycloidal and involute teeth. This shopwork would extend through the entire course of four years, varying somewhat according to the professional course selected.[11]

Such was the earliest plan for a course in shopwork outlined for the purpose of developing skill in the use of manual tools. Woodward was one of the first teachers in the country to point out the need for training in this field. He believed that such training would result in the production of skilled work and would also make students better judges of workmanship.

The entire scheme of higher education went through a metamorphosis, however, when actual scientific research into agriculture, engineering, and industry was inaugurated between 1880 and 1885. Agricultural experiment stations were established for the dissemination of knowledge. Trade schools were transformed into engineering and mechanics' colleges. A little later came the extension service, and the colleges began programs of instruction for people in rural areas. All of these movements had as their basic motive the compiling of scientific and useful data toward a

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11. Charles A. Bennett, A History of Manual and Industrial Education 1870 to 1917.

more practical educational program.

Industrial education was hampered considerably by the lack of a body of technical knowledge. The most important feature of such training was skill in the use of tools, and America had no system for instruction in tool operation. Methods were generally adopted from Russia. This was the case with the first school of mechanic arts established at the Massachusetts Institute of Technology for the purpose of fitting high school students for a particular trade and for developing "bodily and mental powers in harmony."[12] In later years the trend has been away from manual training as a mere formal exercise in the use of tools to handiwork more directly contributory to a knowledge and skill in industrial occupations; there has been a reaction against the early tendencies to exalt the importance of hand training as such.[13] In the 1880's, however, information was available--and most of it meager--only on the use of tools.

Despite lack of information and a severe dearth of trained and competent teachers, manual training schools multiplied throughout the country. In the last two decades of the century the movement was particularly notable in the Midwest, with the main centers of activity shifting from Philadelphia and Baltimore to Chicago, Cleveland, Toledo, and St. Louis. Most of the schools were private, however, and were maintained by wealthy business men. The schools were so popular, though, that manual training high schools sprang up all over the country by 1890, and the manual arts program was even adopted in the reform schools of the nation.[14]

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12. Lewis F. Anderson, op. cit., p. 159.
13. Ibid., p. 221 ff.
14. Cf. Lewis F. Anderson, op. cit., p. 164.

The kindergarten may also have exerted a wide influence, since it was noted for its manual preoccupations. At any rate, all trends led to greater stress on the practical side of education and pointed to the urgent need for a systematized body of knowledge in the various fields.

It was one of the obligations of the land-grant colleges to work toward the acquisition of this body of knowledge; also to supply the teachers to meet the ever growing demands of schools. What was later to become Columbia Teachers' College, incidentally, had as its early purpose the training of personnel in industrial education. Everywhere there was pressure put on the schools, particularly the many new colleges of engineering, to provide practical training in the use of tools and machinery, to accumulate knowledge and perfect techniques on the subject, and to train teachers.

Influencing factors. The following is a brief summary of other major developments that resulted in the tremendous stress on industrial education at the time the Utah State Agricultural College was established in 1888: (1) By 1875 America had come into serious competition with the great industrial nations of England and Germany.[15] (2) During the Industrial Revolution the skilled workman displaced the old-fashioned artisan. (3) Leaders in commerce and industry took a prominent part in guiding education after the Civil War. (4) A great variety of schools developed after 1870, all of them dedicated largely to the practical arts--"the trade-school era", it is sometimes called. Some of the more important schools are: Hampton Institute for Negroes (1870); evening schools (1870); apprenticeship schools (1872); Carlisle and other Indian schools (1879 ff.);

15. Cf. R. J. Forbes, Man the Maker. p. 273.

mechanics' institutes (1885). (5) The art movement in industrial education after 1880 correlated hand training with art and nature study. (6) The "Sloyd" system spread from the Scandinavian countries, stressing both mental and physical development and confining its class projects to objects of value for their beauty or usefulness.[16] (7) Engineering schools increased from 17 in 1870 to 70 in 1872 and 85 in 1885.[17]

Such trends and institutions, coupled with new philosophies of education, prepared the way for the establishment of a modest but potentially expansive course in the manual arts at the Utah State Agricultural College at the time it opened its doors for instruction in 1890.

16. Lewis F. Anderson, op. cit., p. 184.
17. W. J. Kerr, op. cit., p. 11.

THE BEGINNINGS OF INDUSTRIAL EDUCATION AT THE U.S.A.C.

The Agricultural College of Utah, as it was then known, was founded March 8, 1888, when the Utah Legislative Assembly accepted the Act of Congress, approved July 2, 1862, providing for the endowment, support, and maintenance of land-grant colleges. The college was "to teach such branches of learning as are related to agriculture and the mechanic arts . . . in order to promote the liberal education of the industrial classes in the several pursuits and professions in life."[1]

Funds

Under an Act of Congress, approved August 30, 1890, the college received an annual appropriation of $25,000 for instruction in agriculture, mechanic arts, the English language, and the various branches of mathematical, physical, natural, and economic science, with special reference to their application to the industries of life. This appropriation was in addition to the $15,000 granted yearly for the maintenance of the Agricultural Experiment Station. Beyond these amounts the college was dependent upon the State Legislature for funds to meet the requirements of the several departments of the college and to provide for development of the institution consistent with the educational and industrial demands of the state.[2]

First Courses in Mechanic Arts

When the college opened its doors for instruction in September 1890,

1. Quoted from the Lund Bill in the General Catalogue, 1905-1906.
2. Ibid.

the mechanic arts course was taught under the general heading of Mechanical Engineering. This course, according to the general catalogue for 1890, was practically the same in the freshman year as the course in agriculture, except that special attention was given to shop work and drawing. It was believed that the effect of a strong department of Mechanical Engineering would be to stimulate the development of mechanical industries in the territory served by the college. No actual instructor had been provided at the time, however, and therefore no "rigid course" was laid down. A promise was made in the first catalogue that shops would be fitted up "for work in Wood, for Forge Wood, for Vise Work in Iron, for Molding, etc." Students were also to be given instruction in "handling Engines, Boilers, and other machinery." The educational purpose behind these courses was not merely to teach skill in the manipulation of materials, but to give information regarding the underlying principles of mechanical structures and trades involved. "The object will be constantly kept in view," says the introduction to course work, "of training thinkers and not mere routine manipulators--men who will have constructive and inventive talent."[3]

The first proposed course of instruction leading to the degree of Mechanical Engineer (Bachelor of Mechanical Engineering in 1891-1892) was as follows:

Freshman Year

Practically the same as in the Course in Agriculture, save that special attention will be given to Shop Work.

Sophomore Year

The instruction will vary from the Course in Agriculture mainly in Shop Work and Drawing.

3. General Catalogue for 1900. p. 24.

Junior Year

The work this year will include two terms of Physics, including special attention to Electricity and Magnetism, Trigonometry, Geometry, Geology and Lithology; three terms of Mechanical Drawing, Pattern Making and Molding, Vise Work in Iron and Steel, Principles of Mechanism and Heat, Analytical Mechanics, etc.

Senior Year

Surveying and Sanitary Engineering, Analytical Mechanics, Applied Electricity, Mechanical Drawing, Metallurgy, Steam Engines and Boilers, Strength of Materials, Machine Designs, Experiment work in Engineering, Astronomy, Political Economy, and other special work.[4]

It may be interesting to compare this course with the first one proposed for a "manual training" school in America earlier in the century. The first such course of study was drawn up at the Massachusetts Institute of Technology as follows: First year: Shop Instruction (12 hours per week), Algebra (3), Plane Geometry (3), Rhetoric and Composition (3), Freehand Drawing (3). Second year: Shop Instruction (12), Algebra (3), Geometry (3), English Literature (2), French (3), Mechanical Drawing (6).[5]

Facilities

The first classes in Mechanic Arts were held in the basement of the Main building. How much space was given to them, or how much equipment was available, is not known precisely, but neither was adequate to meet increasing demands. By 1896 the Board of Trustees found it necessary to recommend that additional shop rooms either be fitted up in the Main, with such changes as would be necessary to lessen the jar of the machinery, or that the forge room be removed from the basement of "the large building" to a single one-story room to be erected at a cost of $2,000. The

4. General Catalogue for 1900. p. 25.
5. Lewis F. Anderson, op. cit., p. 10.

Board was alarmed by the fact that the shops were being taxed beyond their capacity and that students were being turned away from practical courses.[6]

> The basement (of the Main building) contains the shops for woodwork and iron-work, and the foundry. These departments are well supplied with the usual wood and iron working machines, and with the necessary appliances for metal casting. The machine shops are equipped with engines, lathes, planers, and other machines of recent construction. A new building for shop work is in course of construction, and will, probably, be completed and in use during the ensuing year.[7]

The Mechanic Arts building. In 1896 part of the Mechanic Arts building was completed, and the forge shops were removed from the Main building. In 1897 the Legislature made appropriation for the maintenance of a Manual Training School and for extension of the Mechanic Arts building. Manual training courses were then taught in both Mechanic Arts and Domestic Arts.[8] The catalogue for the year 1898-1899 went into detail describing the "Manual Training Building," as it was called. The architect's drawing of this building, along with several pictures of the physical facilities of the college, was included in the catalogue. The following is quoted from this catalogue:

> The new shop building, situated a little south of the Main building, is one story high, except the central part, which is two stories. The ground floor of this central part is fitted up to accommodate forty-eight students in carpentry. To the east of the carpentry room is the forge room, containing twenty-four power blast forges and anvils with complete equipment of vice benches and tools; in an offset to the north is the power room, containing one five-horse power electric motor and fan for the forge blast, and one ten-horse power motor and exhaust fan, which draws all the smoke from the forges into underground pipes and thence through the exhaust fan to the smoke stack.

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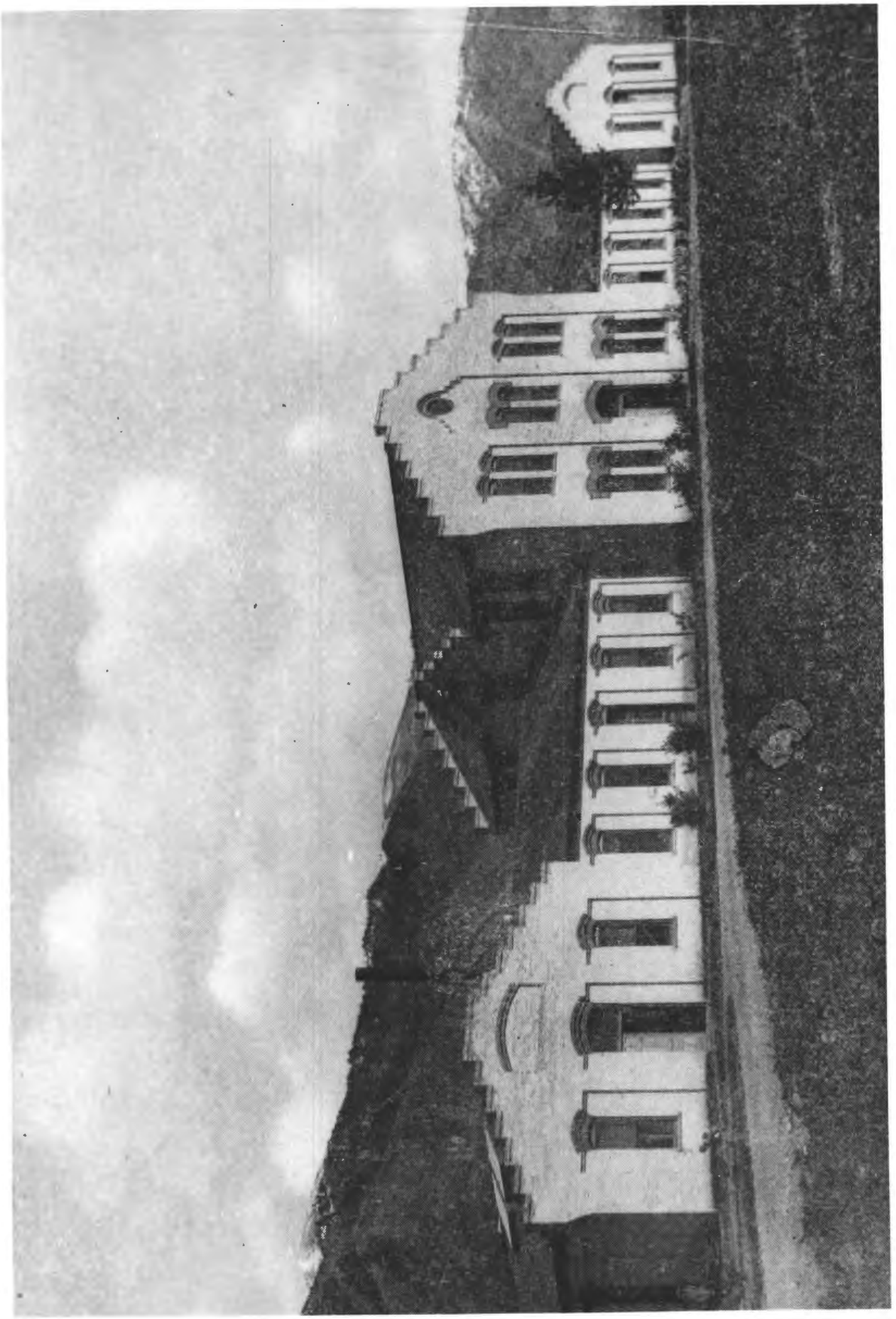
6. Board of Trustees Minutes for 1896.
7. General Catalogue for 1896-97.
8. General Catalogue for 1905-06.



The First Mechanic Arts Building

> Immediately south of the carpentry room is a room used for the wood-working machinery, consisting of ten turning lathes, one planer, one band saw, one universal saw table, one jig saw, grinding stones, etc. Adjoining this on the south is the iron-working machinery room. Its equipment consists of lathes, planer, drill press and milling machine. This room also contains the tool room and a fifteen-horse power electric motor, from which power is derived for all the machinery both in this room and in the wood-working machinery room. The second floor of the central part of the building is divided into three rooms, a classroom for physics and mechanics, the director's office, and a department room well fitted with special drawing instruments and blue-printing apparatus. It also contains the annual class exhibit of students' work in mechanic arts.
>
> The two rooms to the north of the central part, which are exactly similar to those south, are temporarily used as the students' chemical laboratory, and the experiment station chemical laboratory. The walls of the building are of brick and the roof of corrugated iron; it is steam heated and well lighted and ventilated throughout.[9]

The Mechanic Arts Department

Until the year 1895-96, all courses related to Mechanic Arts were listed under Mechanical Engineering, a subdivision of Engineering. Mechanic Arts courses were listed separately in the catalogue for the first time in 1895-96, although in 1894-95 grades were handed into the Registrar's office under the heading of Mechanic Arts.[10] No grades were handed in under this designation during the following year, however, and only in 1896-97 and the years following were Mechanic Arts rolls recorded under that designation.

The course in Mechanic Arts proposed in 1896 had as its aim "to make bright young mechanics, not civil or mechanical engineers of scientific men." The course was outlined for three years, the first being sub-freshman. The difference between this course and previous ones

9. General Catalogue for 1898-99.
10. Teachers' rolls from the Registrar's office for 1894-95.

taught under Mechanical Engineering, it was pointed out, lay in the year of sub-freshman work and the fact that a full year would be devoted each to woodwork, iron-work, and machine work; also, a large amount of time would be given to mechanical drawing; while applied sciences and mathematics would give "reality, breadth, and precision to the equipment of the student."[11]

The general program in shop work for the year 1896 was outlined by the Board of Trustees as follows:

> The student begins with a term in woodwork, two hours daily. A bench and a complete set of carpenter's tools of the best make are assigned to each student. He works at exercises in planing, sawing, chiseling, rabbeting, plowing, splicing, mortising, tenoning, dove-tailing, framing, and paneling. Wood-turning follows, covering all the principles of straight turning, face plane and chuck work.
>
> In the second term forge work in iron and steel are given. Twenty-four power-blast forges, with anvils, vises, and all necessary tools afford opportunity for regular work at the force in drawing, bending, twisting, cutting, punching, upsetting, welding, and the use of flatters, fullers, swages, etc. Tools and other articles are then made by the student.
>
> Cabinet making is taught in the third term, and instruction in wood carving is given to students prepared to receive it.
>
> The second year of shop work embraces pattern making, vise work in iron-chipping, filing, thread cutting, hand polishing, riveting, soldering--and machine work--straight, taper and eccentric turning, thread cutting, taper boring, milling on engine lathes, etc.
>
> The shop work has direct relations with the courses in industrial and mechanical drawing, which are taught at other hours during the same years. It is desirable, as explained elsewhere, to extend the courses of shop work, so as to allow one year each to carpentry, iron work, and machine work, to make better mechanics than is possible with the present time.[12]

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11. Board of Trustees Minutes for 1896. For the proposed three-year course, see Appendix A, #1.
12. Ibid.

The three-year course was inaugurated in 1897-98, its object "to afford students adequate training in the use of hand and machine tools and to fit them for industrial pursuits as proficient carpenters, smiths, machinists, or founders."[13] In addition to the technical work, the course also provided for work in English, history, elementary mathematics, physics, and other general studies. At the completion of the course the student was to receive a certificate. No degree was yet provided for, though one had been given for similar work in Mechanical Engineering.

According to the catalogue for 1897-98, extensive additions to the shops were planned for the following year. Available shop equipment was listed as follows:

> For Wood Working, 24 carpenter's benches with usual sets of tools, seven wood-turning or pattern maker's lathes, one jig-saw, one wood-planer, one band-saw, one universal saw-table. For Iron Work, 24 power blast forges with anvils and tool accompaniments, seven vise-benches, two 17 in. engine lathes, one speed lathe, one Brainard universal milling machine, one large vertical drill press, one large planer. General: emery wheels, grinding stones, special tools, etc.[14]

Demand for the Mechanic Arts courses was great enough that in 1898 it was necessary for the Board to ask the Legislature for an appropriation of $500 a year above the $2000 granted the college for instruction in the field in 1897. Shops, according to the Board report, were running at full capacity, attendance was unusually large, and the value to the people of the State was great.

A third year of college-level instruction was proposed by the Board, and the necessity of building a foundry next to the forge shops was called to the attention of the Legislature. The catalogue, it should be noted, offered a three-year course in Mechanic Arts.[15]

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13. General Catalogue for 1897-98.
14. Ibid., p. 64.
15. Board of Trustees Minutes for 1898.

EXPANSION OF COURSE WORK

During the school year 1899-1900 the Manual Training course in Mechanic Arts was extended through three years, including carpentry, forging, and machine work. Attention was called once more to the increased attendance, and favorable predictions were made for the future. It was also pointed out that a great demand for students of the department existed throughout Utah and adjoining states. Prospects for the graduates were good, with high salaries and plentiful opportunities for work with leading manufacturers and mechanics.[1]

The Four Year Course

The first four year course in Manual Training was offered in the Mechanic Arts department in 1901-02, with the time required in the shops reduced from four to three hours daily. Requests were made for additional equipment, and new lecture classes were proposed. No regular degree was given, however, and students who completed the course were given a certificate.[2]

New equipment. Attention was called in 1898 to the need for a foundry. Joseph Jenson, Director of Shopwork, in a series of letters to the President and Board from 1899 to 1902, stressed the need for new equipment, particularly in electric welding, casting, horse shoeing, and machine work. Additional rooms and apparatus were also called for in the woodwork department. Students were applying for a class in wheel-wrighting

1. Board of Trustees' Minutes for 1899-1900.
2. Board of Trustees' Minutes for 1901-02 and General Catalogue.

and the forge shop was turning students away for the lack of equipment. In 1903-04 the following additions were made to the Mechanic Arts building:

> . . . an engineering laboratory 50 feet by 31 feet, a motor room 19 feet by 20 feet, a foundry 36 feet by 36 feet, a carriage shop 36 feet by 36 feet, a coal bunker 35 feet by 12 feet, and an extension to the forge shop 46 feet by 36 feet, increasing the size of the forge shop to 118 feet by 36 feet. These extensions have made possible the introduction of foundry work and carriage building in the course in Mechanic Arts, besides providing additional room required by the large increase in the number of students in the Mechanic Arts Department. The total cost of the extensions to the shops was $6,539.[3]

This was $2,826 under the amount estimated by Professor Jenson as the minimum to meet the requirements of the department, exclusive of maintenance.[4] In 1903-04 the demand for classes had increased to the point where it became necessary for Professor Jenson to request additional rooms and equipment to the amount of $13,950, at the same time expressing his appreciation for the strengthening of his department in the preceding two years. On his carefully itemized list of needed materials are included "a large roll top desk" and bookcases.[5]

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3. Board of Trustees' Minutes for 1903-04.
4. Board of Trustees' Minutes for 1901-02.
5. Board of Trustees' Minutes for 1903-04.

THE GREAT FIRE

Disaster struck the Mechanic Arts department in 1905, when, immediately after midnight of Monday, September 11, the Mechanic Arts building caught fire from unknown causes and burned to the ground, destroying with it all of its equipment. The fire began in the stock house just south of the forge shop and east of the wood machine shop, a room separated from the main shop building by two narrow alleyways.[1] A special committee appointed by the Board failed to discover any plausible cause for the fire, and insofar as anyone knows, the Student Life's ascribing it to "the reign of King Hoodoo" is as accurate as any reason ever found.[2]

On September 20, 1905, President Kerr (who was in southern Utah at the time of the fire) and the Board notified Governor John C. Cutler of the loss to the school and petitioned him and the State Board of Examiners to permit the college to incur a deficit to the amount of $26,288, this being the figure representing the supposed loss above the $7,100 covered by insurance.[3]

The Examiners took immediate action on the matter and granted the petition. In addition, the citizens of Logan, acting through the Cache Commercial Club, began raising funds to help in the construction of a new building. At least $8,000 was subscribed (if it should be needed). But there is no record that it was ever collected.[4]

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1. Student Life, Fall 1905.
2. Ibid.
3. Board of Trustees' Minutes for 1905-06.
4. Student Life, supra.

Within a few days contracts were awarded for the construction of a new building. It was discovered, however, that the walls of the building had to be replaced entirely, along with some of the foundation, and that the cost of reconstruction was almost 40 thousand dollars, about 23 thousand for the building and 17 thousand for replacing the machinery. The difference between the originally estimated amount and the final cost was made up through small donations by the architects and contractors and by taking approximately six thousand dollars from the general maintenance fund.[5]

It was expected that the new building would be ready for partial occupancy and limited classwork by the beginning of the winter quarter of that year, but contractors had difficulty in getting workmen, the weather was inclement, and delays were frequent. As a result, all of the departments were not able to resume work until the end of the school year, and certain details, like restoring the cupola of the foundry, were not completed until the following November.[6] It was particularly difficult to get the necessary equipment for the new building. Manufacturers of tools and machines could not fill orders promptly, though the college was given priority because of the disaster it had suffered. It even got special prices on many items. At any rate, in the opinion of Director Jenson, the Student Life, and the Board of Trustees, the new building was an improvement over the old one in many respects, and the work of the department was carried on even more efficiently than before. Among the improvements were cement floors, more storage space, more brick in place of wood, and better toilet and washroom facilities.[7]

5. Board of Trustees' Minutes for 1905-06.
6. Ibid.
7. Ibid.

It is noteworthy that as regular classwork began once more, advanced students devoted themselves to the construction of a great deal of new equipment such as work benches, supply and tool cabinets, class and office furniture, and the repair of damaged apparatus.

After the work of renovating the building was completed, the Mechanic Arts department could say with confidence that it ranked with the best institutions of its kind in the country.[8] Equipment was the best to be had and even had the college brand etched on each item. Manufacturers took special pains to give extra quality and finish to the apparatus that was sent to the department, realizing the advertising value that went with the installation.[9] The department had reached sufficient prominence by this time that a Mechanic Arts Club was established, Professor Jenson lectured to the State Teachers' Association on methods in manual training and to the Engineering Society, and students in carpentry prepared exhibits for the Portland fair.[10]

Early Instructors

At the time Mechanic Arts became a separate department in 1895-96, apparently all classes were taught by J. W. Mayo, though actually no teacher was listed for any of the courses. Mr. Mayo was instructor in Mechanic Arts at the time the work was begun at the college. In 1896-97 A. J. Hansen began teaching classes in woodwork--all woodworking classes and some forging. Mr. Hansen taught woodwork for many years as foreman in shop work, assistant professor, and associate professor. During his last years he was an assistant in the library. Joseph Jenson, professor

8. Board of Trustees' Minutes for 1905-06.
9. Student Life, November 1905.
10. Student Life, January and April 1906.

The Mechanic Arts Building Today

of physics and mechanical engineering and director of shopwork, took over machine work and direction of the new department in 1895. In 1901-02 Mr. Edward Parley Pulley, instructor and later assistant professor of machine work and forging, was added as an instructor in machine shop courses, which he handled alone until 1916. J. P. Griffin, foreman of the iron working department, handled almost all of the forging classes from 1897 to 1902-03. At that time Mr. Edwin A. Williams was added to the department as foreman in forging. He directed all the forge work from then until 1907-08 when it was taken over by Mr. Aaron Newey. Mr. Newey came into the department as an assistant instructor, from which position he rose during his long career to assistant professor, then associate professor in forging; finally to associate professor of machine work. Professor Newey taught almost all forging classes until 1920.[11]

11. Data from individual instructor's class reports.

BRANCHING OUT

In the year 1907-08, two years after the fire, the School of Mechanic Arts, as it was often called, began offering instruction in carpentry and forging to 60 night school students in addition to its regularly enrolled number of 136. Aside from these, 59 students from other departments did work in carpentry, and 41 took classes in forging. So many agricultural students took these classes during the winter months that the facilities of the school were used to capacity. Director Jenson's report to the president of the college that year expressed confidence that his department would be able to handle all the students who would come to them in the next two years. His teaching force was adequate, he said, but $500 worth of equipment was needed for the carriage shop. Also, he suggested that the college buy up $1,500 worth of lumber for the carpentry shops, since they were having difficulty getting lumber that was adequately seasoned for their use. Most important of his requests, however, was that for $5,000 for equipment and supplies to begin classwork in a new field--plumbing and steam fitting. A sudden demand had arisen for young men trained in these fields, since the labor unions had severely restricted the number of apprentices who could enter the plumbing profession.[1]

Apparently there was considerable demand for people trained in the Mechanic Arts department, for according to the Board report for July 1908, skilled workers from the department (carpenters, blacksmiths, machinists,

1. Board of Trustees' Minutes for 1907-08. (Apparently this request was never granted.)

carriage builders, foundry workers, and cabinet makers) could immediately command high wages ($5 per day), in contrast to the $2 per day or less paid to common laborers. The general catalogue, though it was not always above using some mild propaganda in its appeal for students,[2] usually kept to a high plane in its discussion of the educational motives of the department. The statement of policy from the 1905-06 catalogue will serve as an illustration:

> It is the policy of the Agricultural College of Utah, in accordance with the spirit of the law under which it is organized, to provide a liberal, thorough, and practical education. The two extremes in education, empiricism and the purely theoretical, are avoided, the practical being based upon, and united with, the thoroughly scientific. All the practical work, on the farm, in the orchards, vineyards, gardens, dairy, commercial rooms, kitchen, sewing rooms, different scientific laboratories, and carpentry, forge, and machine shops, is done in strict accordance with scientific principles. In addition to the practical work of the different courses, students are thoroughly trained in the related subjects of science, and in mathematics, history, English, and modern languages. While the importance of practical training is emphasized, the disciplinary value of education is kept constantly in view. It is recognized that the mind and eye and hand must be trained together in order to secure symmetrical development. The object is to inculcate habits of industry and thrift, of accuracy and reliability, and to foster all that makes for right living and good citizenship.

Although the main difficulty of the department was to get sufficient equipment and enough room to meet the ever increasing demands of the students, it should be mentioned that the expanding program was hampered to some extent by the lack of both texts and periodical material. A special library was set up in the Mechanic Arts building which consisted of the private library of the professor and such other books from the general library as were needed for special study. The department boasted an extensive list of manufacturers' catalogues, which formed an important part

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2. Cf. 1891-92 issue, p. 22, for example.

Instructor Demonstrating a Delicate Piece of Work in the Machine Shops.

The Forge Shops at a Busy Hour

A Student Boring Automobile Cylinders

A Class in Oxy-acetylene Welding.

A Corner of the Machine Shops

Classes in Progress

of their library. This, it should be noted, is not far removed from the time when the college library listed the Delineator, Good Housekeeping, and the Journal of American Folk Lore as "scientific and technical magazines".

Building Space

Beginning in 1909-10 agitation began for more building space for the department. It was recommended that the north and south wings of the Mechanic Arts building be increased to two stories to correspond with the central portion of the building. It was also reported that the roof was in very bad condition, resulting in considerable injury to tools and lumber during the wet weather. Room was needed for work in the repair of farm machinery (mentioned for the first time), for space in which to give lectures and demonstrations, for a department office (with a wash basin), for draughting, and for exhibits.[3] It was estimated that $10,000 would be needed for the reconstruction, but no plans were drawn up immediately. Need for the addition was recognized, however, since the department continued to grow, and the outlook according to the Board minutes for 1909-10, was never brighter. Mr. W. S. Drew, with an A. M. degree from Columbia, was brought in that year as director of the school, though there is little record of his activities. Apparently he taught only two classes in the department (with a total of five students). Drew was hired in 1910 and left the college in 1913.[4] During these years he was director of the School of Mechanic Arts and acting director of the School of Agricultural Engineering, though he taught no classes.

The new second floor was not added to the building until the school

3. Biennial Report for October 22, 1910, and November 1, 1912.
4. J. E. Ricks, A History of Fifty Years. p. 170.

year of 1913-14, even though the matter was brought up regularly, along with the condition of the leaky roof. It was difficult to tell what the student demands would be for the different classes, since unpredictable numbers came in from other departments. For example, in the year 1909-10, for which complete figures are readily available, of the 175 students who received grades in Mechanic Arts courses, only 109 were registered in the department. Certain new courses drew very few students. Wood carving, for instance, was offered with little or no success for four years and was dropped in 1912. Other courses, like Mechanical Drawing, could be taught elsewhere (and were), though it was felt that some correlation to the work of the department was lost as a result of their being too far removed from the shops.[5] There was some fear, also, that a decrease in enrollment would result from the proposed discontinuance of the high school work in Mechanic Arts, even though the department was beginning in 1912 to offer a course leading to the B. S. degree. The high school work was given up in 1913-14, with a small loss in enrollment; and at the same time the extra story was added to the north and south wings.[6] According to a letter by Professor Aaron Newey to the president, no actual decrease in enrollment resulted for the year when the high school work was dropped; the department was affected, he said, "in grade of students only".[7]

The catalogue for 1913-14 was able to announce that the Mechanic Arts building was a two-story structure with 20,000 square feet of floor space divided into five groups of rooms, all well equipped: wood working department, machine shop, drafting room, forge shop, a museum, a blueprinting

5. Biennial Report for October 22, 1910.
6. Board of Trustees' Minutes for 1913-14.
7. Ibid.

room, a room for painting and staining, and classrooms. It also mentioned that room was provided for the department of Agricultural Engineering. The Foundry was put into running condition, the roof was free from leaks, the rooms were light and clean, and the department had everything it needed except a regular assistant.

The housing of the department of Agricultural Engineering in the Mechanic Arts building was quite natural, since the two departments were closely associated and under one director: W. S. Drew from 1911 to 1912; Frank S. Harris in 1912; and later Ray B. West from 1917 to 1936.[8] It was Harris who officially divided the School of Mechanic Arts into departments in 1912: Woodwork, Forging and Carriage Making, and Machine Work and Mechanical Drawing.[9]

Courses Offered

In 1911-12 two courses in Mechanic Arts were offered: a four year course and a short course of two years. Upon completion of the four year course, the student received a certificate of graduation.[10] In 1912-13 three courses were offered: a four year high school course, a short course, and a four year course leading to the B. S. degree.[11] In 1913-14 the four year course leading to the B. S. degree was offered, along with a "short practical year and winter" course.[12] This course pattern was followed for several years, but in 1915-16 the school also offered three year trade courses in contracting and building, forging and carriage work, and automobile repairing. A two year trade course was offered in

8. Board of Trustees' Minutes for December 9, 1912, and Ricks, op. cit., p. 104.
9. Board of Trustees' Minutes, supra.
10. Catalogue for 1911-12, p. 48.
11. Catalogue for 1912-13, p. 55.
12. Catalogue for 1913-14.

painting and interior decorating.[13]

The automobile. Although the advent of the automobile was mentioned from time to time as having a bearing on the development of the Mechanic Arts department, no actual courses were offered dealing with the automobile until 1914-15. The class in Automobile Work, said the write-up for the course, dealt principally with the power plant and transmission system and offered the students the privilege of making certain parts such as cams, pistons, connecting rods, etc.[14]

The following year three courses were listed, one under "Technology of Mechanic Arts" and the other two under "Machine and Automobile Work". This was the first time that such sub-headings were included in the catalogue under the School of Mechanic Arts. In 1915-16 Director Ray B. West called the attention of the president to the courses in automobile work and to the need for more room and more up-to-date equipment. The one automobile used by the school for study was housed in the already overcrowded machine shop and was many years out of date.[15] A request was also made for an assistant in automobile work, which had been handled by the regular personnel in forging, carriage, and machine work. Professor E. P. Pulley requested $500 worth of used cars for the next year's work and pointed out the need for providing space where cars could be handled while undergoing repair. The machine shop was full of machinery, and the door was too small for automobiles. Small rooms were also needed where the vulcanizer could be placed for tire work; where work could be done on ignition, starting, and lighting apparatus; and where repair parts,

13. General Catalogue for 1915-16.
14. General Catalogue for 1914-15, p. 112.
15. Board of Trustees' Minutes for 1915-16.

A Class in Auto Repair

Students Learning Vulcanizing

A Class in Storage Batteries

Students Studying Gasoline Engine Operation

Students Studying Ignition, Starting and Lighting.

Automobile Repair

materials and the like could be stored.[16] The automobile was apparently becoming a vehicle with which to be reckoned.

Trivia. The major concerns of the School of Mechanic Arts at this time were the problem of the automobile, increased attention being given to farm motors, farm blacksmithing, and the construction of farm buildings; but many small problems presented themselves. For instance, the floor in Room 3 of the Mechanic Arts building was giving way owing to the stress of the heavy machinery, and a new concrete floor was suggested. A "dire need" was expressed for a sanitary toilet, dressing rooms, and locker room in the building. Professor Hansen of the Woodwork department wanted, among other things, a new electric glue pot with a water jacket. Professor Aaron Newey supposed that his Forging department would have to purchase the gas for the oxy-acetylene welding apparatus acquired the year before. Because student demand was not sufficient to justify a full course and a regular instructor in blacksmithing, Mr. William Thornley of Smithfield was hired to teach a yearly winter course of eight afternoon demonstrations each. Mr. C. A. Hansen of Logan was also hired to do the moulding in the foundry, which ran regularly four times a year, turning out castings used mostly by the college.[17]

16. Board of Trustees' Minutes for 1915-16.
17. Ibid.

WORLD WAR I

Since 1917, the institution has consistently aided the Federal Government in war and post-war programs. During 1917-18, the college trained 492 young men in its Reserve Officers' Training Corps. Six hundred eighty soldier mechanics were trained at the institution during the summer of 1918. With the establishment at the college in the fall of 1918 of a unit of the Students' Army Training Corps, 724 men were given collegiate and vocational military training.[1]

During the school year 1917-18 the first major demands were made upon the School of Agricultural Engineering and Mechanic Arts for the training of soldiers. Almost every department was taxed to its capacity. In June of that year the school began training U. S. soldiers as mechanics and technicians, the first contingency being 288 men; the second, 432 men; and the third, beginning November 15, 1918, 700 men.[2]

Professor L. R. Humphreys in the department of Farm Mechanics called for more equipment, particularly in road building and motor work, to meet the demands of the new mechanical epoch. He reported that his department had trained 523 soldiers in vocational work. The immediate enrollment of Students' Army Training Corps was 192 auto mechanics, 23 chauffeurs, and 5 farm motors students.

The Woodworking department trained 100 soldiers during the summer of 1917-18. In general, the school trained chauffeurs, auto mechanics,

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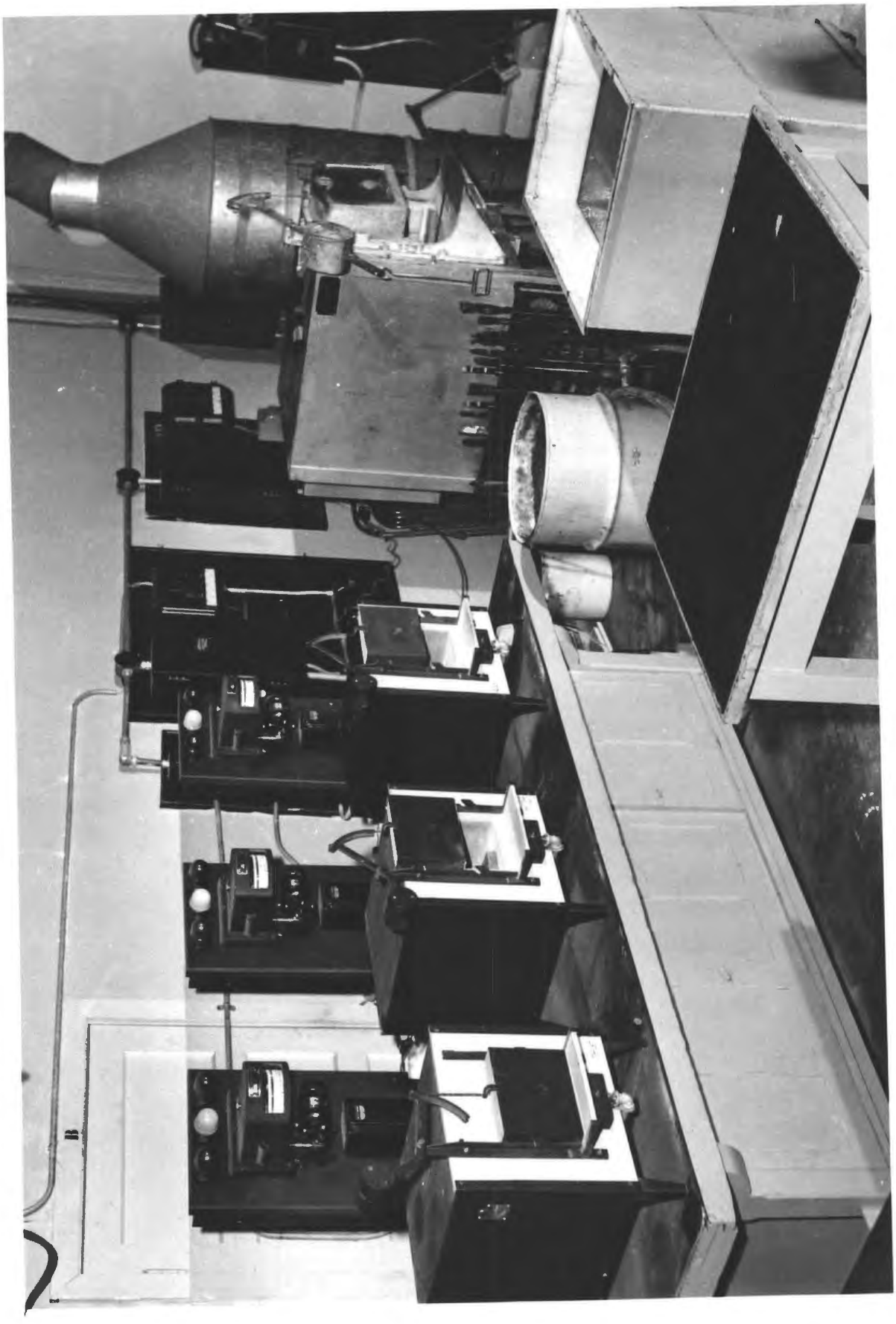
1. General Catalogue for 1919-1920, pp. 28-29.
2. General Catalogue for 1917-1918.

rough carpenters, blacksmiths, machinists, concrete workers, radio operators, blacksmiths, woodworkers, concrete workers, wagoners, surveyors, draftsmen, telephone electricians, and horseshoers. The classes were among the largest of any in vocational training camps throughout the country, and the work was of such excellence that the District Director of the work said that the Army would contract for all the men the college could possibly accommodate.[3]

Improvements

Because the Army wanted men who were not merely trained in theory and technique, but who "could really do the work", actual building practice was given, resulting in a frame building for drying and evaporating fruit (for the Horticulture department), two portable garages, a new automobile repair shop, concrete steps in front of the Smart Gymnasium, concrete work on a new granary, and walks in front of the Livestock building. Also, the Federal Board for Vocational Education lent the school a number of machines: four 16-inch lathes, one turret lathe, one gap lathe, two drill presses, one power hack saw, two grinding wheel stands, and many small pieces of machinery. A request was made to have an 80-foot extension added to the machine shop, since all the new equipment so overcrowded the place that it was unsafe for the men to work so close together. The most impressive acquisition was a building put up to house the soldiers and constructed with the aim of turning it into a classroom building when it was no longer needed as a barracks. It was planned, according to Director Ray B. West, as a building for the School of Agricultural Engineering, to house the departments of Irrigation and Drainage, Farm Mechanics,

3. General Catalogue for 1917-1918.



Heat-Treating Equipment

Mechanical Drawing, Surveying, Rural Architecture, and Roads. The basement was to contain a modern irrigation laboratory for water measurement demonstrations. This building was first mentioned in the 1919-1920 catalogue as being ready for occupancy in the fall of 1919.

Requests. Professor Newey of the department of Forging called attention to the fact that the carriage shop, foundry, and part of the blacksmithing shop had suffered from lack of heat for 12 years. He thought proper heating would be a decided improvement. Ray B. West asked for a new cylinder-boring machine for automobile work and for a tenoning machine for the Woodwork department, which A. J. Hansen said they had been needing for 20 years. He also wished that the government teacher-student ratio could be made standard: one instructor and two assistants for each 30 students. The Forging department asked for a permanent assistant and a small building to be used exclusively for horseshoeing, which was enjoying a revival at the time. Farm Mechanics wanted two new instructors and expressed thanks for its new garage.[4]

Post-War Vocational Education

"As soon as the Armistice was signed, the Federal Board for Vocational Education immediately began organizing its work for rehabilitation of disabled soldiers, sailors, and marines."[5] The college was asked to train disabled men in several lines of work. The first men came in March of 1919 and the number was steadily increased until December 1920, when a total of 170 was enrolled. Revenue from the tuition of these men made it possible for several departments to expand. Aside from the tuition fees, the Vocational Education program was aided by the loan from the

4. Board of Trustees' Minutes for 1917-18.
5. Board of Trustees' Minutes for 1919-20.

Federal Board of $25,000 worth of machinery (previously mentioned). These machines were seemingly purchased from the government later.[6]

Post-War Changes

What had been the Machine and Automobile Work (mostly machine) became in 1921-22 the department of Farm and Auto Mechanics,[7] with ten classes devoted to the construction, maintenance, and repair of farm motors, machinery, and automobiles. In 1920 Professor A. H. Powell, head of the department, called attention to the amount of study concentrated on the gasoline engine and to the number of classes dealing with motors and machinery. Enrollment increases in the automobile classes, said Professor Powell, had been very rapid, and the purchase of expensive equipment was necessary. He asked for a complete oxy-acetylene welding plant, a small air-compressor, two aviation engines, and complete automobile tool room equipment. He mentioned, too, the popularity of the new short course in tractor operation and care, taught in the winter for the benefit of farmers who were not able to leave the farm at any other time. Field men from the various manufacturing concerns were brought in to help with the work. The Student Life reported on the course:

> Three Special Short Term Courses Now in Convention at the Agricultural College
>
> Tractor Course
>
> One of the most popular courses in tractor work that has ever been given in the Intermountain West is now being conducted at the College. At present there are 125 men enrolled for the work and new enthusiasts are being added to the list daily. These men represent towns extending from southern Idaho to southern Utah. They realize that the tractor is fast replacing the horse and are preparing to take the lead in more modern methods of intensive farming. The department of Farm Mechanics has left no

6. A. H. Powell letter to the president, Biennial Report for 1920.
7. General Catalogue for 1921-22, p. 135.

> stones unturned in preparing for this very practical course. Although the work will last only two weeks, it is so arranged as to meet the needs of both tractor owner and tractor salesman. So intense and practical is the work that both these classes of men will leave here at the end of the term prepared to meet any requirements that may be made of them in this field. They have at their disposal six different types of tractors which have proved most popular in the West. Each of the companies represented has an expert in charge of its machine. During the term each of these machines will be torn down and the class members will have the experience of putting them together. By this means they will be taught the principles of the mechanism, proper care and operation of tractors. In addition to the experts in attendance with the machines an excellent force of instructors has been provided, including Prof. Hendricks, Prof. A. H. Powell, Prof. Newey, Mr. Wintchell, and Mr. Stock. These men are all experts in their line.[8]

Mr. Powell suggested that a plan be perfected whereby some of his teaching staff could study field problems in order to place in the hands of the County Agents the information constantly sought by farmers throughout the state.[9]

Some discrepancy as to date exists regarding Mr. Powell's request (not dated in the Biennial Report for 1920) and the Student Life report on the installation of some of the equipment. According to the issue for November 25, 1919:

> New Equipment for Mechanic Arts Building.
>
> The school of Mechanic Arts has just installed a complete oxy-acetylene welding plant, large enough to maintain 12 welding torches. A welding school will begin at the Institution December 8 and a special six weeks' course in welding given. This is the only school to be established west of Chicago and it is thought that many auto mechanics throughout the Rocky Mountain region will be attracted to the college to secure training in this work.
>
> According to Professor Humpherys of the Mechanic Arts department, the call for trained welding experts induced the college to install this elaborate welding equipment. Twenty-four men can now be trained in each school of six weeks' duration. The students in training will be given one-half day of

8. Student Life, January 23, 1920.
9. Biennial Report for 1920.

welding and one-half day in machine and blacksmith work.

> In addition to the welding equipment, the school of Mechanic Arts will install many other machines for the opening of the winter course work. These will comprise wood mortising machinery and lathes for the wood working department, and engine lathes, drill presses, grinding machines, shapers and many other small machine tools for the machine department. Upon installation of this new equipment the Mechanic Arts department will be fully equipped.[10]

Forging

The end of the war brought the Forging department its busiest year, and according to Mr. Newey, its greatest work in its history had been done in the training of Soldier Mechanics for the Army. Enrollment increased some 50 per cent over the years before soldier training work began. This department, too, was teaching special work for students in automobile, tractor, and farm implement work, the fastest growing in the school.

Woodwork

After the lean year of 1918-19 when very little class work was done because of the influenze epidemic, enrollment in the Woodwork department for 1919-20, according to A. J. Hansen, was the greatest in history, with a summer school enrollment 100 per cent greater than in any previous summer. Total enrollment for the year was 230. Teaching the "Federal students", as they were called, had been very pleasant and would add prestige to the department, along with advertising the college favorably in many localities. Equipment, however, was showing the effects of wear. Much of it was worn out and out-of-date.[11]

Ray B. West, then dean of both the schools of Agricultural Engineering

10. Student Life, November 25, 1919.
11. Board of Trustees' Minutes for 1919-20.

and Mechanic Arts, could report that despite the need for replacing certain items of equipment the facilities were generally adquate and that shop instructors were cooperating with the State Department of Education in taking teachers' training courses, which were proving very beneficial.[12]

12. Board of Trustees' Minutes for 1919-20.

PRACTICAL VALUE OF MECHANIC ARTS

The practical value, along with the expansiveness, of the work in Mechanic Arts is summed up in the Biennial Report for 1919-20:

The Trades and Agricultural Engineering

> Under our federal charter it is necessary that the College emphasize mechanical arts. This it has done during its entire history. It regularly trains for practical work, carpenters, blacksmiths, foundry workers, farm mechanics, auto and tractor experts and machinists. Its training in agricultural engineering relates directly to irrigation and drainage, architecture, and construction of farm buildings, cement work and highway construction, surveying, rural sanitation and public health, agricultural manufacturing and technology and related work. Here we deal not only with engineering as it relates to agriculture, but this work has a direct bearing upon new industries and the development of our great latent natural resources.

The school continued to stress the importance of relating classwork to the actual needs of the people, as is evidenced by the many short courses taught. In 1921 several new courses were introduced in automobile and tractor operation and repair. Demand was already so strong for automobile courses that much of the work had to be handled in the irrigation laboratory room, seriously handicapping the instruction in irrigation laboratory work.[1]

To aid auto mechanics, two half-time courses were instituted in 1921 dealing with ignition and batteries. As a help to the car owner himself, a general course in automobile construction was offered in which a person could obtain a thorough knowledge of the parts of his car. This was a full-time course of 12 weeks, but it ran for only half time so that the student could also take other work if he desired.[2]

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1. Biennial Report for 1919-20; letter of Ray B. West to the president.
2. Student Life, February 18, 1921.

On March 4, 1921, the Student Life announced that among the 100 new courses in the college when doors were opened for the beginning of spring quarter would be new classes in auto and tractor operation and repair. Courses, it said, would be offered both to fit people to operate their own cars and to prepare men for the profession of auto and tractor repairing. Surveys were even made of the machinery used on the farms in order to determine the best type of care that should be given it. Plans were to give more and more work in general farm mechanics.[3]

The department of Machine Work at this time almost completely revamped its courses in order to put them on a production basis and to teach only standard shop practices. This was especially necessary to meet the demands of the officials in charge of the Soldier Rehabilitation work. The government added several machines to the department, but much of the equipment was not adequate for the requirements of modern practice. Professor Newey, in a letter to the president, suggested that since the school had in its charge the development of mechanic arts in the State, and since Utah might soon become a metal producer on a large scale, the college needed to be in the forefront insofar as heat-treating metals was concerned. He asked for a new electric furnace to replace the forges used for this purpose. The department did not even have a gas furnace for such work, since no gas was available for one, and was therefore far behind the times in a vital matter.[4]

The Idea of Service

> In addition to preparing men for the many vocations open in this field, the School of Mechanic Arts offers many courses supplementary to the work of other schools in the College. The agricultural

3. Board of Trustees' Minutes for 1920-22; letter of A. H. Powell.
4. Ibid.

> student can obtain in the School of Mechanic Arts just the information he needs to enable him to do the constructive work in farm buildings and the repair work necessary in operating machinery, thereby making farm life more profitable and desirable. Those who intend to enter engineering will find no better preparation than that offered in the mechanic arts courses. In the shops, a knowledge of the nature of materials, methods of construction, and operation of machinery, can be had better than elsewhere.[5]

One of the constant references made regarding the work in Mechanic Arts has to do with its service to farmers, mechanics, car owners, soldiers, and to the work of other departments in the college.

> The work of the Forging department during the last two years has been quite successful. The major part of our work is to teach forging to automobile, ignition, tractor, machine, and agricultural students, keeping in mind the part forging will have in each of these lines of work. A number of students have taken the work to become blacksmiths. We have aimed to dovetail our work in with the courses of other departments. Our policy has been to change the work to suit the varying conditions.
>
> Now that the Federal men have discontinued our numbers are much smaller. It seems to me that our big aim should be from now on to take the boy from the farm and teach him the care, repair and maintenance of all farm machinery---educate him to the farm.[6]

The Woodwork department even suggested that its members visit the high schools to get acquainted with their wants. It also helped the Federal men to make all kinds of useful household articles and farm items. Students in bee culture took Woodwork and made hundreds of hives for their future use.[7]

The catalogue stated that all products of the Mechanic Arts shops were the property of the school, students being allowed to take away specimens of their work only by permission. Apparently this permission was often granted. Popularity of the idea of service courses may be seen

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5. D. E. Robinson, Preparing for Success.
6. Board of Trustees' Minutes for 1923-24; letter of S. R. Egbert.
7. Ibid.; letter of A. J. Hansen.

from the number of vocational classes offered in any one year. In 1921-22, for instance, in Farm and Auto Mechanics and Mechanic Arts, 12 such courses were taught, including Storage Battery Repair, Forge Practice, Machine Shop Practice, and Harness Repairing (taught by Mr. Swenson of the Woodwork department).

The school constantly stressed the application of its work on the everyday activities of the working man. The catalogue statement for 1921-22 is typical:

> This school offers three-year trade courses in contracting and building, forging and carriage work and automobile repairing; a two-year trade course in painting and interior decoration; and a four-year college course leading to the degree of Bachelor of Science.
>
> The information offered finds application in every industrial activity and is much demanded by the rapid growth in the mechanical and industrial pursuits. As more and more of the work of man is done by machinery and labor-saving devices, it is desirable to obtain information that will enable man to meet the new conditions intelligently. The many applications of electricity and gas power in the factory, shop, home on the farm, and the advent of the automobile demand a knowledge of materials, tools, machines and processes.
>
> The agricultural student can obtain in the School of Mechanic Arts just the information he needs to enable him to do the constructive work in farm buildings and the repair work necessary in operating machinery, thereby making farm life more profitable and desirable. Those who intend to enter engineering will find no better preparation than that offered in the mechanic arts courses. In the shops a knowledge of the nature of materials, methods of construction and operation of machinery can be had better than elsewhere. The demand for manual training teachers is far in advance of the supply.
>
> The drafting rooms give thorough work in the methods of making mechanical drawings and afford opportunity to specialize in the line of work the student is pursuing, such as architectural, carriage, machine and agricultural drawing.
>
> Students may major in art, iron work, mechanical drawing, machine and automobile work, technology of mechanic arts and

woodwork. Vocational courses are also offered.[8]

Success

Along with the idea of service went also the appeal of success. The notion that a graduate in the field of Mechanic Arts could immediately command higher pay in industry than could the unskilled was mentioned in several catalogue write-ups. In 1923, when students could not only graduate in the department of Auto Mechanics, but could choose a major in either automobiles, ignition, or tractor work, even the course descriptions sometimes struck a competitive note and pointed the way to success. For example, the course in Automotive Electrical Equipment and Shop Management taught the student, among other things, "shop kinks and the development of skill, accuracy, and speed to prepare him to compete with those already in the commercial field."[9]

D. E. Robinson, in charge of information service at the college, in a bulletin seemingly prepared to attract more students into the field of Mechanic Arts, and entitled, "Preparing for Success--A Message to the Ambitious", pointed with pride to the fact that the school offered training for the contractor, automobile mechanic, tractor operator, teacher of mechanic arts in high schools and technical schools, gas engine experts, cabinet worker, carpenter, iron worker, foundry man, expert machinist, and draftsman--all with lucrative employment beckoning them on. One entire building, he emphasized, was given over to instruction in auto and tractor work itself; and the U. S. Government had placed over $30,000 worth of equipment at the college, including a complete automobile machine shop to supplement the considerable equipment owned by the

8. General Catalogue for 1921-22, pp. 59-60.
9. Ibid.

institution. Tractors, trucks, and autos of all makes and descriptions were available for study.[10]

Complaints

The principal complaints of the various departments at this period was that the equipment of the school had not kept pace with that of industry in general. Constant references were made in letters to the president that suggested economies were inconsistent with the need for new equipment. Mr. Newey pointed out the serious fact that the college was still using forges for heat-treating metals, whereas machine practice had been revolutionized in the past 20 years. A $1,500 grinding machine was badly needed in his department, along with the electric furnace he had mentioned earlier. The first request for such a furnace was made by Mr. Jenson in 1899-1900. Mr. Powell's department of Farm Mechanics and Automobile Work, despite all its government-supplied equipment (not all of it up-to-date), needed a new arc-welding machine and a battery charging machine. Mr. Hansen of the Woodwork department also complained of the antiquated equipment in his field, most of it bought 20 years ago and now a handicap to the work and a humiliation to the instructor. He was especially interested in getting new machines with safety devices. Their mortiser had been condemned.[11]

10. D. E. Robinson, op. cit., 1923.
11. Board of Trustees' Minutes for 1923-24. Letters.

PERIOD OF UNEASY STABILITY

Beginning in and around the year 1925 the school of Mechanic Arts went through a period of shifting emphasis, with enrollment generally stable for the whole school, but with sharp rises and declines in certain departments.

Forging

In Forging the shift of emphasis is most noticeable. In 1924-25 some 27 classes were taught. The next year the number had decreased to 19, and increased the following year to 26, with much stress on vocational courses. In 1927-28 the department offering had shrunk to 10 classes and continued to decline thereafter, even though Smith-Hughes work in metals and plumbing was added, as was body and fender work.

Merger

One of the most important changes of this period came in 1927-28 when the Mechanic Arts work went into the School of Engineering. This move, according to O. W. Israelsen, then Acting Dean of Engineering, was made because of the close and important inter-relationships in the instruction of these fields. Thus, the School of Mechanic Arts and the School of Agricultural Engineering were combined in the new School of Engineering. Students could receive degrees, however, in either Mechanic Arts or Agricultural or Civil Engineering.[1] A full course in Engineering had been made possible by the passing of the Course of Study Bill in the State Senate, February 14, 1927.[2] The event was referred to as the beginning

1. Biennial Report for 1926-28; letter of O. W. Israelsen.
2. J. E. Ricks, op. cit., p. 12.

of a new era for the college, but for Mechanic Arts it meant a decade of subordination, even though the work in that division continued to expand.

Vocational

At this time the number of civilian vocational students went into an abrupt decline, decreasing by one-third in a two-year period in Engineering. The collegiate enrollment increased one-tenth in the same period, however, and continued to rise, as did the general enrollment of the college, which went from 1162 in 1926-27 to 3088 in 1938.[3]

Summer Session. The first Summer Session held at the college, aside from earliet summer vocational and military work, came in 1924, with a distinguished visiting faculty and a student enrollment from 24 states and five foreign countries of 1377. A generous course offering was made in Farm and Auto Mechanics, with eight instructors listed. Mechanic Arts listed offerings in two departments, Machine Work and Woodwork and House-building. Work in the latter department was increased the following year, whereas the number of classes in Farm and Auto Mechanics declined slightly. Throughout the first years of the National Summer School, as it was called, expansive offerings were made in all these fields, including teacher-training courses in shop work. In the summer of 1928, the first year after Mechanic Arts became a part of the School of Engineering, the Summer Session offering was reduced sharply and remained meager for several years.

One of the more successful efferings of the Industrial Division to the summer work was that in Driver Education and Traffic Safety, introduced for the first time in 1929 by Professors E. C. Jeppsen and H. S. Carter, in order to train teachers of similar courses in high schools.

3. J. E. Ricks, op. cit., p. 115.

The class was taught under the specifications set up by the American Automobile Association and the National Traffic Safety Council, and by 1941 it was required of all graduates in Industrial Arts and Highway majors in Engineering.[4]

Radio

The most notable addition to the Mechanic Arts work during this period was that of radio classes in practical radio construction and service. This work was added to the Department of Ignition, Starting, and Lighting, and had as its aim to acquaint students with the equipment used in reception and broadcasting, and to teach the methods of repairing and building receiving sets. The first classes were taught by Professor Sidney Stock.

The Depression Years

Very few new courses were added to the Mechanic Arts division, aside from those in Radio, from 1929 to 1936, though enrollment rose slowly but steadily from 552 to 874 (number who actually received grades). The catalogue, beginning in 1931-32 (which also included the courses for 1932-33), stressed the pragmatic value of the work in the division of Mechanic Arts, its object being the training of "efficient auto mechanics and garage foremen, auto electricians, machine shop foremen and high school shop teachers".[5] The two-year trades courses were also given special mention.

Dean Ray B. West of the School of Engineering called attention in 1929-30 to the fact that his school acted as a service department for the other schools. This was preliminary to his request for more modern

4. Summer Session Bulletin for 1939; letter of George D. Clyde to E. G. Peterson dated January 21, 1941.
5. General Catalogue for 1931-32, p. 52.

equipment. The often-mentioned electric furnace was asked for once more, as was new machinery for the Woodwork department.[6]

Another outstanding addition to the Mechanic Arts work during these years was that in aviation. No such work had been taught since a gesture was made in that direction back in 1917-18. In 1930-31 aviation courses were introduced by Professor Sidney Stock in principles of flight, types of planes and gliders, materials, and other pertinent subjects. In the following year considerable equipment was secured from the government for laboratory and training purposes, and an Aviation Ground School was established. This work had been anticipated from the beginning of the aviation program, as may be seen from the Student Life report:

> Air Courses May Be Added to Curricula
>
> A school of aeronautics may shortly be added to the U.S.A.C. curriculum, according to S. R. Stock, professor of auto mechanics. President E. G. Peterson, now attending the convention of land-grant colleges at Washington D. C., has announced his intention of visiting the Secretary of War, accompanied by Senator Smoot and Congressman Colton, in an effort to secure government assignment to the college of equipment enough to offer a course in the ground work of aeronautics.
>
> Laboratory equipment, to be obtained from the government will include no less than five airplane motors of standard make, as well as gliders and planes that have been discarded by the Army Air Service.
>
> Anticipating the course, students in auto mechanics, under Professor Stock, are now building miniature models of airplanes and biplane gliders patterned after current popular makes. One student, for example, is constructing a copy of the famous Spirit of St. Louis. One dozen models are almost completed, all of different design.
>
> An actual course in flight and gliding will not be conducted by the department at any time, Professor Stock announces. Aside from the prohibitive cost of such a course, there is no suitable location in Cache Valley where experimental flying might be attempted in safety.[7]

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6. Biennial Reports for 1929-30; letter of Ray B. West.
7. Student Life, November 30, 1930.

EXPANSION

Trade Courses

Mechanic Arts was listed once more as a separate school in 1937-38, responsible to the dean of the School of Engineering. The number of students receiving grades in the various classes increased that year from 874 to 1606. One reason for this rise was unquestionably the introduction of a non-collegiate section to the work in Mechanic Arts. This section offered two year terminal trades courses in Auto Mechanics, Machine Shop Practice, Carpentry and Building Construction, and Radio. The objective was to train young men to become skilled tradesmen without going through the customary long apprenticeship of industry. All persons 18 years of age or over, whether high school graduates or not, were eligible for the work, either upon the recommendation of their high school principal, or the approval of the dean of the School of Engineering and Mechanic Arts. No credit was given for this work, but a "Certificate of Completion" was given to a student who completed any of the prescribed courses.[1]

Welding was added to the trades course offering in 1939 as one of the "widespread improvements to the college's industrial arts and trades departments".[2] The college also announced that the small welding room in the Mechanic Arts building had been remodeled, and a new generator and modern welding equipment had been added.

Pilot Training

One of the most energetic programs for the year 1939-40 had to do

1. General Catalogue for 1937-38, p. 181.
2. Student Life, October 26, 1939.
3. Ibid., p. 29.

with the training of pilots, something that had not been anticipated when the aviation program began in 1930-31. George D. Clyde, dean of the School of Engineering, after the death of Ray B. West in 1935, announced on August 28, 1939, that the aviation training program proposed by the Civil Aeronautics Authority would provide, when approved, for the training of fliers up to the point of securing a private pilot's license. This, said Dean Clyde, would involve a minimum of 35 hours of flying training and a maximum of 50 hours, together with 75 hours of ground school work. Only a limited number of students would be admitted.[4]

In the Student Life for the same day, William Skidmore, NYA project supervisor, told of the arrival of a 1932 moderl Curtiss monoplane from the United States Army, to be used in the air training program for that fall. It was delivered to Mr. Skidmore (Public Relations Chairman), C. Lester Pocock, Dean Clyde, and S. R. Stock by Lieutenants Howard Engler and Robert Fulton of Lowery Field, Denver.

On October 5, 1939, Student Life reported on the initial work of this Civilian Pilot's Training course, which had been initiated that year into 166 American colleges and universities. The work here, directed by S. R. Stock, had an imposing list of applicants for the course, which cost $40 in addition to the regular fees of the college, thus making it available to students who could not have afforded the training under any other conditions. After the student received his private pilot's license, he required only a few additional hours of flying time to get his commercial license also. Further lures were held out to the student by showing the opportunities offered for still more training through the Army or

4. Student Life, August 28, 1939.

Navy. Assurance was given that there was nothing "militaristic" about the course, and that its purpose was to train "safely and adequately" those students who have given promise of interest and ability to fly as private pilots but have not been financially able to take flying lessons. Thirty students would be permitted to take the course the first year. The work continued until September 1942.

A week later, however, the Student Life inadvertently remarked that the training was designed to "bolster the nation's pilot reserve for both civil and military needs".[5] Upon completion of advanced course work, students were eligible to go directly into advanced flight training in either the Army or Navy schools.[6] (Note: In 1942 all trainees in the program had to enlist in the Army Reserve Corps before they could begin their training.)[7]

In 1940 a student could work toward a Bachelor's Degree in Aeronautics. This four year course was the result of the excellence of the work done in the ground school and flight-training work, widespread student requests, and the demands of the national defense drive.[8] Scholarships were even offered to outstanding students. The Shell Oil Company offered three, amounting to $1,000, $750, and $500, respectively.[9] Courses were also offered during the Summer Session of 1940.[10]

In order to provide adequately for the instruction in aircraft engines and mechanics, considerable renovation of the Mechanic Arts building was necessary. Floor space was added to the building, and the entire back

5. Student Life, October 12, 1939.
6. Ibid., October 10, 1940.
7. Letter of George D. Clyde to E. G. Peterson, July 24, 1942.
8. Student Life, October 3, 1940.
9. Ibid., January 5, 1940.
10. Summer Session Bulletin, June 17, 1940.

court was enclosed. The north wing on the first floor was divided into four laboratories for both radio and aircraft work.[11] The gun sheds were also remodeled to house some of the equipment in Agricultural Engineering and Aviation.

The National Defense Program

On September 11, 1940, Dean Clyde reported to President E. G. Peterson that the college had just completed the first eight-week unit of the new National Defense Program and was requested by the State Department and the Federal Government to continue the work. The purpose of the work was to train men for jobs in the national defense industries. That fall 17 different courses in trades and mechanical work were offered. In addition, night school classes were conducted three nights a week from 7:00 to 10:00 p.m. To meet the requirements of the program, the teaching staff was increased approximately 50 per cent.[12] With the addition of the vocational and national defense courses to the curriculum of the Mechanic Arts division, students were able to get training in almost any of the important trades and industries in courses varying in length from eight weeks to four years.[13] It is interesting to note that the first workers to be trained in the defense program, which began July 15, were selected jointly by the W.P.A. and the local employment office.[14] Two types of courses were offered: "(1) Supplementary training courses for men already employed in key industries to improve their skill; (2) courses for men who through the training will become qualified as skilled workers in key industries".[15]

11. Student Life, October 3, 1940.
12. Ibid.
13. Ibid., September 7, 1940.
14. Ibid., July 15, 1940.
15. Ibid.

It was intended that special staff members would be hired for most of this work, but the plan was not feasible for several reasons. It was necessary for someone from the regular staff to be on hand to see that power and equipment were handled properly; only regular staff members were capable of handling certain specialized work (like pattern-making, for instance, which was directed by D. A. Swenson); and men for certain work like welding were not available at once.[16] New staff members were not easily obtained, especially since they were generally hired on a temporary basis, some on per diem.

The 13 courses in the program were: Aircraft Communications, Automotive Mechanics, Blacksmithing, Drafting, Machine Shop, Metal Finishing, Heavy Duty Equipment, Pattern Making, Welding, Aircraft Sheet Metal, Aircraft Engines, Automotive Electrics, and Radio Service and Repair.[17]

The cost of the first eight-week program was $45 per student.[18]

All of the National Defense work in the Division of Technology was under the general direction of Deal Clyde, but the actual supervision of the work was carried out by Ernest C. Jeppsen, chairman of the division.

16. Letter of George D. Clyde to President E. G. Peterson, September 11, 1940.
17. Ibid.
18. Ibid., September 24, 1940.

THE INDUSTRIAL DIVISION

In 1940 a committee was appointed by the president to consider the question of a name to substitute for Mechanic Arts. This committee made up of Deans George D. Clyde of Engineering and Technology, Christine B. Clayton of Home Economics, and Ernest A. Jacobsen of Education, finally decided upon the term "Industry", partly because they felt that the term "Industrial Education" should be reserved to designate graduate work.[1] It was stipulated also by the dean of the School of Commerce that this term should not be construed to include Industrial Management. The designation "School of Engineering and Industry" was then suggested, with two major divisions: Engineering Division, and Industrial Division.[2]

On May 24, 1940, the Deans' Council instructed the catalogue editor to change the name of the school to Engineering, Industries and Trades, a slight variation of the first proposal. The departments in the new Industrial Division, however, were not too clearly defined and titled in every case. Aircraft was an inadequate term for Aeronautics. Industries and Trades was found to be a confusing designation since it resulted in overlapping of all the departments in the division. Industrial Arts was not used anywhere. After experiencing some difficulty in the matter of budgets for the various departments, Dean Clyde in 1943 recommended certain clarifications: the departments in the Industrial Division would be as follows: (1) Aeronautics, (2) Automotive, (3) Metal Work, (4) Radio,

1. The first Master of Science degree ever given by the department was conferred in June 1949. (Cf. Biennial Report for 1948-50).
2. Letter of George D. Clyde to President E. G. Peterson, dated May 11, 1940.

(5) Woodwork and Building Construction, and (6) Industrial Education.[3]

National Defense Courses

A considerable variety of defense courses was offered by the college, many of them associated directly or indirectly with the work of the Industrial Division. Pre-employment refresher courses were given in more than a dozen types of work, including radio, aircraft engines, blacksmithing, sheet metal work, machine work, automotive mechanics, and wood pattern making. Evening supplementary courses were offered in the same fields; also evening preparatory courses in aircraft construction, auto electrics, machine shop, and acetylene welding. In addition, two special courses in preparatory training for occupational adjustment were offered in steam heating and pipe fitting and in general metals. All of these courses were available to non-college citizens who could meet certain very simple requirements.

Since much of this work was handled in the Mechanic Arts building, trouble soon began with regard to the inadequate facilities. It was found that the building was poorly lighted, badly ventilated, had little storage space for materials, and had very few lockers. Also, in a building used almost daily by 250 college students and 350 defense students, no ladies' toilet was provided, and only three toilets and two urinals were available for the men. No space was provided for either a game room, lunch room, or study for the trainees, who, during their leisure moments, generally congregated on the cold slope of the hill. Dean Clyde recommended the expenditure of $11,600, most of it to be used to make the building more

3. Letter of George D. Clyde to President E. G. Peterson, dated April 6, 1940.
4. From folder entitled "Utah State Agricultural College National Defense" in Dean Clyde's personal letter file for 1941.

pleasantly habitable and slightly larger (by roofing over the 12 feet by 37 feet space between the blacksmith shop and auto shop).[5]

Dean Clyde had urged some time before that a new two-unit building be constructed to house the aircraft and automotive units of the national defense work, thus bringing the floor space up to the 10,000 square feet required by the Civil Aeronautics Authority for approval of the Aircraft and Engines Mechanics school the college was seeking.[6]

The college was given final approval on December 4, 1941, to conduct a school in combined aircraft and aircraft engine mechanics, giving the institution first place in the intermountain country for the training of aircraft engine mechanics.[7] The college became the only school in the state, or in the intermountain region to qualify for such a program.

In July 1941, the Industrial Division could report that it had in the preceding year trained 945 students in preparatory courses and 528 in supplementary courses, for a total of 1473 national defense students.[8] This was a 250 per cent increase over the defense enrollment for a like period in 1940. As many as 32 classes were in operation at one time, with 41 persons involved as instructors, office personnel, and assistants. All classes were outlined on a production training level planned in accordance with the Dictionary of Occupational Classifications put out by the U.S. Department of Labor. Each trainee was required to complete one occupational unit before beginning another. At the conclusion of each unit of work, a report was made to the State Employment Service in order that the trainee's availability for employment might be known. Also, the

5. Letter of George D. Clyde to President Peterson dated December 6, 1941.
6. Ibid., dated June 14, 1941.
7. Ibid., December 17, 1941.
8. "The Record", National Defense Weekly Progress Report for July 21-28, 1941.

trainees were put to work wherever possible and as soon as possible doing actual production work, such as welding engine stands for the Aircraft department or building and repairing college radio transmitters. (A rather complete report of this work is given by George D. Clyde in a summary of the National Defense Training for 1941 sent to President Peterson, August 2, 1941.)

On July 18, 1941, the college was asked to provide four courses for Mechanic Learners at Hill Field. They were to be sent to the college for four months, after which they were to be returned to Hill Field for additional training toward becoming Helpers. According to the proposed schedule, the first classes were to begin in September.[9] The work appears not to have begun until December 1, 1941.[10] The program was to last for a one year minimum and involve the training of around 500 Learners.

The program actually operated from September 1941 until September 1943. During this time 3403 Mechanic Learners and Signal Corps Trainees were trained. For the entire War Production Training program (Mechanic Learners, Signal Corps Trainees, Pre-employment and Supplementary Trainees --total 5,828) the government provided $146,028.40 in equipment (almost one-half of it for Aircraft) for the use of the Industrial Division. Also, much of the existing equipment was put in good repair.[11]

In March 1942, the National Defense program had expanded to the point where many of the facilities of the college were taxed beyond capacity. Mechanic Learner courses were then open to women, making the construction

9. Letter of George D. Clyde to President Peterson, July 25, 1951; and letter of C. C. Minty to George D. Clyde, July 18, 1941.
10. Letter of George D. Clyde to Local Draft Board No. 2, November 27, 1941.
11. Biennial Report for 1942-44 in the School of Engineering, Industries and Trades; letter of George D. Clyde to President Peterson, August 2, 1944.

of a rest room for them in the Mechanic Arts building a necessity. Some 900 students were using the building at the time, with as many as 350 at once during the peak load of the day. There were not enough classrooms; the building had a paint and dope room in its interior, constituting a fire hazard; stock was unprotected and deteriorating in the open air; and welding was being done in the open. Dean Clyde once more requested improvements, this time to the State Superintendent of Building Construction.[12] The work was begun almost immediately thereafter in six units, including the recommended addition to the aircraft laboratory.[13]

Naval Radio Training school. In 1942 the college was requested to train enlisted men, Navy and Marine, in elementary electricity and radio material. The first contingent of 100 men arrived in March 1942, and the last group graduated August 4, 1944, with a total of 2,538 men. The course was for 12 weeks, with a new class beginning every four weeks. A total of 36 civilian instructors were used during the program, with never more than 20 at any one time.[14]

As a result of the expanded activity in the Radio department, that work came to occupy the entire second floor of the Mechanic Arts building north of the Woodwork department, except for the northeast corner room. The conduct of the Naval Radio program, as well as the War Production Training program, the Civilian Pilot Training program, and the Army Specialized Training program, was the responsibility of Dean Clyde.

The war training programs that were largely the responsibility of

12. Letter of George D. Clyde to Alton B. Paulson, March 2, 1942.
13. Letter of President E. G. Peterson to George D. Clyde, March 26, 1942.
14. Biennial Report for 1942-44 in the School of Engineering, Industries and Trades.

the Industrial Division were (1) War Production Training, (2) Mechanic Learners, and (3) Signal Corps Radio. Under the Engineering Division were the (1) Engineering Science Mechanical War Training, (2) Civilian Pilot Training, (3) Naval Radio Training, and (4) Army Specialized Training. The divisions were not always clear-cut, however.[15]

Post-War Expansion Program

The trades and industries program which had been in effect prior to 1941 was given added emphasis because of the war, leaving the Industrial Division in urgent need of additional space, especially since no major building construction had taken place during the war years. Thus, in the proposed post-war building schedule outlined in November 1944, one of the main projects was to be a new shop building (or buildings) to cost approximately one-half million dollars. Such a building had been requested by Dean Clyde at least as early as 1941.[16] He pointed out in 1944 that the present trend in education was toward providing training in the technical institute and vocational fields. (Governor Maw, it should be noted, issued a curtailment order affecting Vocational Education during the midst of this expansion. However, the Legislature in 1947 increased the appropriation to the college for this work from $15,000 to $225,000).[17]

Most of the equipment acquired by the college during the war-training programs would be available for use, for it had become the property of the State. Much more equipment would become available through war surplus property. Dean Clyde suggested that the new building contain 40,000 square

15. Organizational Charts, figure 3.
16. Letter from Dean Clyde to President Peterson, June 14, 1941, and December 6, 1941.
17. Letter of E. C. Jeppsen to George D. Clyde, June 4, 1945; letter of J. E. Christiansen to F. S. Harris, July 21, 1947, on the respective matters.

feet of space, be constructed as a factory-type building, and be located north of the Rural Arts building in space then occupied by the Poultry department. The building construction could be broken down into four schedules, each to be completed by a specified time ranging over the next four years. Utah, Dean Clyde emphasized, was destined to become an industrial state.[18]

In 1946 the Industrial Division found itself even more crowded as school opened with a record enrollment in that field. Courses in Air Conditioning and Refrigeration were started in a temporary wooden building attached to the north end of the Temporary Union building (TUB) located behind the Library. Other temporary buildings in the area near the Rural Arts building were also used to house much of the equipment of the Refrigeration classes. In September 1946 Photography and Engineering Drawing, which had previously been taught in the Engineering building, were also moved to one of the temporary buildings where they have been since.

No space whatsoever was available for certain classes, such as Diesel Engines and Auto Body Reconditioning. More space was particularly needed by the Automotive and Woodwork and Building Construction departments. Dean J. E. Christiansen suggested that a request for needed buildings be made before the current Legislature and the construction be of garage-type, for which materials were more readily available than for other types of buildings.[19]

During the year 1946 a great deal of the work of the Industrial Division had to be carried out in downtown garages. For instance, the diesel and body and fender work was done in the Humphreys and Evans Company garage

18. Post-War Building Program issued by Dean Clyde in November 1944.
19. Report of J. E. Christiansen to President F. S. Harris, October 24, 1946.

and the Canon garage.[20] Enrollment in the division for the year 1946-47 was double that of the previous year, making shop space a matter of great urgency.[21] Plans were even made to erect a plaster-board room in one corner of the Canon garage for a temporary paint room.[22] Actually, only canvas was used to construct the room, with a fan placed in the window for ventilation. There classes were taught in auto refinishing and metal refinishing until toward the end of the spring quarter, when the fire department condemned the set-up as a fire hazard and a menace to health.[23] The next fall the work was again back on the campus.

The space problem in 1947 was so desperate that the college, anticipating even greater problems for the following year, sent two men to California to determine whether it would be feasible to purchase from Gardner Field a steel hangar and have it shipped to Logan for use as an aeronautics and automotive building. It was discovered, however, that all parts of the dismantled hangar could not be shipped, and that the whole project would be too costly at best.[24]

At the same time, the State Board of Examiners had in their possession a request for the two shop-type buildings. Plans for the building, one for Aeronautics and one for Automotive, was approved by Governor Maw and the Board of Examiners in July 1947 and $25,000 was appropriated to begin the work.[25] It was thought that two such buildings could be built and equipped for approximately $200,000.[26]

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20. Agreements and letters in J. E. Christiansen file for October 9 and December 30, 1946.
21. Letter of E. C. Jeppsen to J. E. Christiansen dated March 11, 1947.
22. Office memo from E. L. France to E. C. Jeppsen dated March 27, 1947.
23. From personal knowledge of the author.
24. Letter of J. E. Christiansen to F.S. Harris September 20, 1947.
25. Letter of E. C. Jeppsen to J. E. Christiansen dated July 22, 1947.
26. Letter of J. E. Christiansen to State Board of Examiners dated June 27, 1947.

By January 5, 1948, Dean Christiansen of the School of Engineering and Technology, Professor E. L. France, head of the Automotive Department, and architect G. W. Schuab were able to attend the opening of bids for construction, held in Salt Lake City. The bid was let to the Campion Company for a net amount of $189,180 and the college was permitted to ask an additional $15,000 of the Building Board to provide certain rooms and facilities that were not included in the bid.[27] It was expected that the building would be completed by August 1, 1948. The request for the $15,000 was granted.[28] However, the building was not ready for occupancy when school opened in the fall of 1948. In fact, most of the equipment was moved into the building during the fall quarter, with both student and faculty help, resulting in considerable confusion in several classes. During the Christmas holidays a great deal of organizing of machines and tools was carried out in order that everything would be ready for the opening of the winter quarter.[29]

The total cost of the building, after provision was made for certain minor oversights such as the omission of telephones and a test pit for the Aeronautics department, was about $215,000, the amount appropriated for the building and for "extras".[30]

All work in the Automotive and Aircraft departments was moved into the new building, officially named Technology. (The Automotive department the following year changed its name to Automotive Technology.)

After the completion of the Technology building, the Mechanic Arts

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27. Letter of J. E. Christiansen to F. S. Harris dated January 5, 1948.
28. Letter of Heber Bennion, Jr., to the Department of Finance, Dean Christiansen, et al. dated January 10, 1948.
29. Personal data of the writer.
30. Letter of J. E. Christiansen to President F. S. Harris dated April 5, 1948.

building was remodeled to provide increased space for Industrial Education, Welding, Woodwork and Building Construction, and to provide a Materials Testing laboratory for the Civil Engineering department. The space formerly used by the Aeronautics department was turned over to the Woodwork and Building Construction, and the space that had been occupied by the latter was made available to Industrial Education for a laboratory and for three additional classrooms to be shared by other departments in the division. Official announcement was also made of a change that had partially taken place some time before; namely, that the air Conditioning and Refrigeration department had been moved to the temporary heating plant, building RH, and that building TG was in use by the Photography unit.[31]

Radio. Following the war the Radio department, which had grown in a very short time from a modest part of the Ignition, Starting and Lighting department, to one of the most rapidly expanding fields in the school, had gone through a gradual change from the general education type of course to one more aptly associated with technical engineering. Graduates of the department, according to Professor Larry Cole, were finding ready employment in the professional field of communications and electronics engineering, both through civil service and commercial openings. The work of the department compared favorably, he maintained, with that of the best schools in the country. He felt it would be desirable, however, to remove the work from the Industrial Division; first, because of the association which tended to lower the professional standing of both the student and his prospective employer; and second, because of the technical-engineering nature of the work.[32]

31. Biennial Report, School of Engineering and Technology 1948-50, p. 4.
32. Letter from L. S. Cole to Dean J. E. Christiansen dated July 22, 1946.

Although Professor Cole's suggestion was not carried out, the Radio department became Radio and Electronics in 1947. Though the catalogue continued to stress the practical aspects of the work, it also carried the following statement to attract students and clarify its position:

> The unusual growth and development in the fields of radio, communications, and electronics has created a constantly increasing demand for well-trained engineers, technicians, operators, and maintenance men. Graduates and former students of this department have found excellent positions and opportunities. A record of past graduates shows employment in the following major fields: Radio Broadcasting--Engineers and Operators; Civil Service--Radio Engineers and Technicians; Industrial--Radio Engineers and Technicians; Radio Servicing--Technicians.
>
> The Department of Radio maintains extensive contacts with industrial and government agencies that employ technically trained men, and gives employment assistance to students who have completed various phases of training.[33]

House Construction. In 1947 it was suggested that in order to supply practical experience for students in Woodwork and Building Construction a training program be provided wherein the students would build a house each year. The program would have the good will of building materials dealers and local labor unions. The plan was first to purchase a lot, then design and build a house to fit--the work extending through three quarters. Finally, the house would be sold at auction.[34] The legality of the proposal was duly tested in 1948, and the project was carried out essentially as planned, beginning April 2, 1948. To date, one of the two houses so built has been sold.[35]

Veterans' Training. There would appear to be little doubt that the pressure of the Veterans' Training program had a great deal to do with the expansion of facilities that led finally to the construction of the

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33. General Catalogue for 1947-48, p. 206.
34. Letter of Joseph Coulam to President F. S. Harris dated November 10, 1947.
35. Conversation with D. A. Swenson, former head of the Woodwork department.

Technology building. In August 1946 President Truman signed Senate Bill 2085, which provided $75,000,000 to be distributed among American colleges to help increase teaching facilities wherever a need could be established in relation to the education of veterans.[36]

The first quarter of the 1945-46 school year brought 600 veterans to the college, and 125, or about 20 per cent, enrolled in classes in the Industrial Division. It was estimated that before the next year, when a new freshman class of veterans would be added to those who would then be sophomores, the facilities of the Division would have to be doubled. New laboratories, equipment, and instructors were urgently needed for vocational courses, particularly for new ones to be started in the spring and the next year in Photography, Printing, and Electricity. A plea was also made that the college arrange with top administrative personnel in the Armed Forces and Congress to secure excess and surplus equipment and supplies.[37]

The college fortunately already had a sound and timely Vocational Industrial program in line with the needs of the Public School Vocational Education program for Utah.[38] Vocational and Technical courses were both filled to capacity during the winter quarter of 1946, and many veterans actually had to be turned away because of lack of facilities. For several years the veterans expanded the enrollment in both the two year terminal classes and the regular four year classes leading to a degree.

On-the-Job Training. One of the veterans' programs directly concerned with work of the Industrial Division was that of the On-the-Job Training

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36. Letter of President F. S. Harris to Administrative Officers and Faculty dated August 15, 1946.
37. Letter of E. C. Jeppsen to President F. S. Harris, January 14, 1946.
38. Ibid., dated August 2, 1945.

for veterans, begun on a limited scale in 1945 and greatly expanded in 1946. The work was at first under the direction of Professor E. C. Jeppsen; then, on April 24, 1946, Mr. Ben Van Shaar was appointed as coordinator of the work on the campus. A controversy developed shortly thereafter with Weber College over the assignment of veterans from Box Elder County. That territory had originally been assigned to the U.S.A.C. when the Supervisory Personnel Training program was started in 1942, and for that and other reasons it was re-assigned to the U.S.A.C. in 1946. This college appeared to be in a better position to supply the training, particularly since it had the staff to bring the work to the high schools. Comparatively few students at the time traveled either to Weber or the U.S.A.C. for the work in evening classes.[39] The classes were held in Brigham City and at Bear River High School. Other misunderstandings of a different nature arose as the program developed, particularly as to whether the On-the-Job and Related Training program could be carried on under the contract with the Veterans' Administration or whether it would be necessary to put it under the direction of the State Trade, Industrial and Business Education program, where it ultimately fell.[40]

According to Mr. Van Shaar[41] the veterans received their On-the-Job Training in vocations of their own choice and took their Related Training at the college evening school programs---either on or off campus. The requirement was that a minimum of 144 clock hours per year of Related Training had to accompany the On-the-Job program of each veteran. The college received 56 cents per clock hour of instruction and was in charge of providing the training of students in Cache, Rich, and Box Elder counties.[42]

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39. Letter of E. C. Jeppsen to W. L. Wanlass dated April 10, 1946.
40. Letter of H. B. Gunderson to J. E. Christiansen September 17 and October 3, 1947.
41. From a conversation with Mr. Van Shaar.
42. Ibid.

According to a report made on the evening school work for the school years 1948-49 and 1949-50 by C. D. McBride, then director of the program at the college, most of the enrollment of evening classes was made up of veterans who were training on-the-job under the G.I. Bill, although during the latter year the privilege of enrollment was extended to non-veterans. Most of the students came to the campus for the training, though in 1948-49 classes for mechanics were held in Brigham and Tremonton. Credit for the evening classes was in the form of T-credit, or terminal credit, though a student could with some difficulty and expense obtain college credit if he wished. Many of the students wished ultimately to work toward a college degree, though most came to increase their industrial competence.

During 1948-49, 27 classes were held in 14 different departments, with an enrollment of 148 students. In 1949-50 there were 41 classes taught in 12 departments, with an enrollment of 289 students for the

Table 1. Enrollment for evening school classes at U.S.A.C.*

Year	Veterans	Non-veterans	Mechanic Learner	Total
1946-47	185			185
1947-48	193			193
1948-49	141	7		148
1949-50	175	114		289
1950-51	226	84		310
1951-52	415	134	63	612

*From records of C. D. McBride.

two terms. Almost all of the work was of a vocational nature. Each term was of 12 weeks' duration. All of the teaching was done by regular college instructors and assistants.[43] Although the demand for evening classes remained rather constant, it is not extensive at the present writing.

43. Biennial Report for 1948-50, School of Engineering and Technology, pp. 31-32.

THE PRESENT

Since the title became Division of Technology in 1947-48, several changes have come about. The Vocational Technical program has been reduced; Welding has become a separate department; and the work in Radio and Electronics, Metalwork and Mechanical Drawing, and Forging has gone into the Engineering Division. (For other changes by year, see Appendix B).

The Division is now (1952) composed of six departments, each under a separate head: Aeronautics, headed by Hugh A. Buntine; Air Conditioning and Refrigeration, headed by Cecil J. Sharp; Automotive, headed by Edward LeRoy France; Industrial Education, headed by William E. Mortimer; Woodwork and Building Construction, headed by Joseph Coulam; and Welding, headed by Antone B. Kemp.

These departments are designed and maintained to serve the expanding needs of an industrial economy in keeping with the stipulation of the original charter for land-grant institutions, that they provide for the "liberal and practical education of the industrial classes". Three major programs are outlined by the Division to fulfill this education obligation: (1) the Industrial Technology program, that trains engineers, technicians and craftsmen through a four year period leading to the Bachelor of Science degree; (2) the Industrial Education program, which offers professional training for teachers, supervisors, and administrators in Industrial Education, with graduate work toward the Master's degree also offered; and (3) the Vocational Technical program, now much curtailed, which offers a two year course designed to prepare skilled technicians for industry.[1]

1. General Catalogue for 1951-52, pp. 215-16.

A Corner of Old Main Today

CONCLUSION

It would appear from this study that the Industrial Division of the Utah State Agricultural College has experienced a most useful, progressive, and expansive history. For over a half century it has kept pace with the demands of industry and the school system and has provided trained teachers and skilled technicians in both peace and war-time pursuits. It has also met the exigencies of two world wars and distinguished itself for its vocational service in rehabilitation work following these wars. It has grown rapidly during both of these periods, both with regard to the number of students trained and facilities made available for this training.

When Mechanic Arts first became a separate department, distinct from Mechanical Engineering, in 1894-95, its subdivisions of Wood Work, Machine Work, and Forging were housed in the basement of the Main building and gave grades to a total of 64 students for the year. In 1952 the work of the six departments of the Division requires the space of the entire Technology building, part of the Mechanic Arts building, and parts of at least two temporary buildings; and the class enrollment for the year was 2,518.[1] The highest enrollment was in 1948-49, when 5,186 individual class grades were given to students. During its entire history from 1894-1952 the Division has given 56,770 individual class grades to students.

Recommendations

No attempt has been made here to study the organizational pattern

1. Students receiving grades.

of the Division or to evaluate the course programs in any or all departments. Such a project lies outside the intentions of this thesis; however, it is recommended that some future work might well concern itself with the difficult problem of evaluation or with a careful analysis of the reasons and motives behind the shifting of emphasis on different kinds of work over the years. It is also possible that a worthwhile thesis might be written on the contributions of each instructor since the beginning of shop work in the school. This writer feels that such a study would be extremely interesting.

SUMMARY BY DEPARTMENTS

Mechanic Arts (General)

The work in Mechanic Arts was originally considered as a part of Mechanical Engineering, but in the catalogue for 1895-96, when the "branches of training" (to borrow a term used by the Sewing branch for that year) were listed alphabetically (or nearly so) for the first time, Mechanic Arts was given a special designation. Under it were listed the class offerings in Mechanical Drawing, Woodwork, Forging, Machine Work, and the rest of the departments, all of which were known generally as Shop Work, with the exception of Mechanical Drawing. All courses were taught by Mr. Mayo, and certain ones carried a notation that they were to be considered as Mechanical Engineering courses in Mechanic Arts. Terminology was in its early groping stages, making it difficult to get a clear picture of just what was meant by the term, Mechanic Arts, though it would appear that the shop training probably made the distinction between what were purely Mechanic Arts courses and what were Mechanical Engineering. This supposition does not hold, however, for both Mechanical Drawing and Machine Work were referred to as Junior M.E. classes, whereas Forging and Pattern Making are strictly Mechanic Arts. In the following year, 1896-97, all the Mechanic Arts courses were shop work courses, and no mention was made regarding their connection with Mechanical Engineering. Mechanical Drawing became one of the classes in the Drawing branch (a separate section of the catalogue), which also included "Freehand Drawing", "Machine Design", and "Thesis".

Early editors of the catalogue were not always sure what to call the

different "lines of instruction", as various fields such as Mechanic Arts were known. Individual classes themselves did not always have titles, merely descriptive classifications. What were later to be called departments were known for some time after the turn of the century as Courses of Study, a more specific term; but certain designations still remained somewhat vague. What was called "Manual Training" was given in both Domestic Arts and Mechanic Arts. The Manual Training courses in these two fields included, aside from manual work in Sewing, Forging, and Penmanship, such non-manual items as English, History, Geography, and Military Drill. Nothing can be said to have been unusual, for it was customary to teach Elocution in Mechanical Engineering, Dairying and Dairy Practice in Domestic Arts, and Military and Manners and Morals in both these fields.

Foundry work has been discussed separately along with Forging, but certain other courses, difficult to classify under any general headings, should be mentioned. What was introduced as Sloyd in several departments, an attempt to make use of a type of project work that was very popular in Manual Training schools throughout the country, never developed beyond one or two course offerings, and by 1911-12 it was largely dropped from the curriculum. The purpose of the Sloyd work might best be seen from the discussion in the 1904-05 catalogue:

> This course in Sloyd is intended primarily for younger students who are not sufficiently developed physically to carry the heavier work of the regular Mechanic Arts courses. It is also well adapted for teachers who desire to qualify themselves for teaching Sloyd in district schools. The best Swedish and American methods are followed.
>
> I. (a) Simple household and shool-room articles, such as pointers, bread-boards, clothes-horses, foot-stools, scoops, etc., constitute the exercises of this course. Elective. Four

hours a week during the first term. Two hours credit.

(b) The work of this course consists of elementary turning and scrolling, simple carving, and the completion of a small cabinet. . . .[1]

Technology is another term with not too specific limitations. Technology courses were required of Mechanic Arts students for several years and were intended to acquaint the student with physical properties of materials and to give him a "practical knowledge of the various forms of motion, its production and modification as used in the class of machinery he expects to handle."[2] Presumably someone had a concept of what was meant by this, for the courses were offered regularly from 1906-07 until 1919-20 and included classes as diverse as "House Building and Contracting" and "Automobiles".

Horse Shoeing was very seldom taught as a regular class, though it was offered occasionally in the winter quarters, and it enjoyed a span of popularity during the World War I years.

Harness Repairing has been mentioned elsewhere as an orphan course that did not fall readily into any departmental offering and was usually listed exclusively at the end of the Woodwork curriculum, since it was taught by Mr. D. A. Swenson.

It is not always possible to trace a particular course from its beginning to end, since it appears to have been the early policy to teach the class first, give it a title if possible, list it where it was most fitting or convenient, and get around to matters of precise classification later. Often, too, a course like Mechanical Drawing has been shifted about so much that it is difficult to follow. Occasionally a whole

1. General Catalogue for 1904-05, p. 104.
2. Ibid.

department, Metalwork and Mechanical Drawing, for example, which was changed to Tool Engineering when it was absorbed by the School of Engineering, can easily be lost unless the circumstances of its disappearance are known.

Woodwork and Building Construction

Like Forging, the early Woodwork classes were a part of the Shop Work courses in Mechanic Arts, and as such they remained from 1895-96 until 1901-02, when Carpentry became one of the three divisions of Mechanic Arts. The Woodwork department, known under various designations, probably had the most consistently progressive, stable, and trouble-free history of any of the departments considered. With few exceptions, its addition of classes has been regular throughout Its work has also been extremely popular with vocational students.

Aside from the courses one would expect to find in this department, there are a few that seem to have a dubious relevance, such as "Art Leather Work" and "Elements of Plumbing". A request for a course in plumbing was made in the early days of the college, and repeated occasionally thereafter, but no class was taught until one was listed in the department of Metalwork and Machine Shop in 1939-40; then in 1941-42 a class in "Elements of Plumbing" was added to the Woodwork and Building Construction curriculum.

Though it was never officially a part of the departmental offering, Mr. Swenson taught a class in "Harness Repairing" for many years beginning in 1921-22. This course was very popular, particularly with vocational teachers in high schools. Mr. Swenson also taught "Furniture Upholstering" after taking a course at Dinwoody's in Salt Lake City.

This class was never officially listed in the catalogue. Mr. Swenson started a course in "Fancy Furniture" in 1917-18, but had to abandon it because too much of his time was taken up with the work in "Pattern Making", a specialty which he learned at the Armor Institute of Technology.

Woodwork classes, after they were moved from the basement of the Main building in 1898-99, were located in the center of the Mechanic Arts building. In 1914-15 some of the work was moved upstairs.

Much credit for the excellence of this department and for the practical value of its work is due, says Mr. Swenson, to A. J. Hansen, for many years head of the department and a top man in his field.

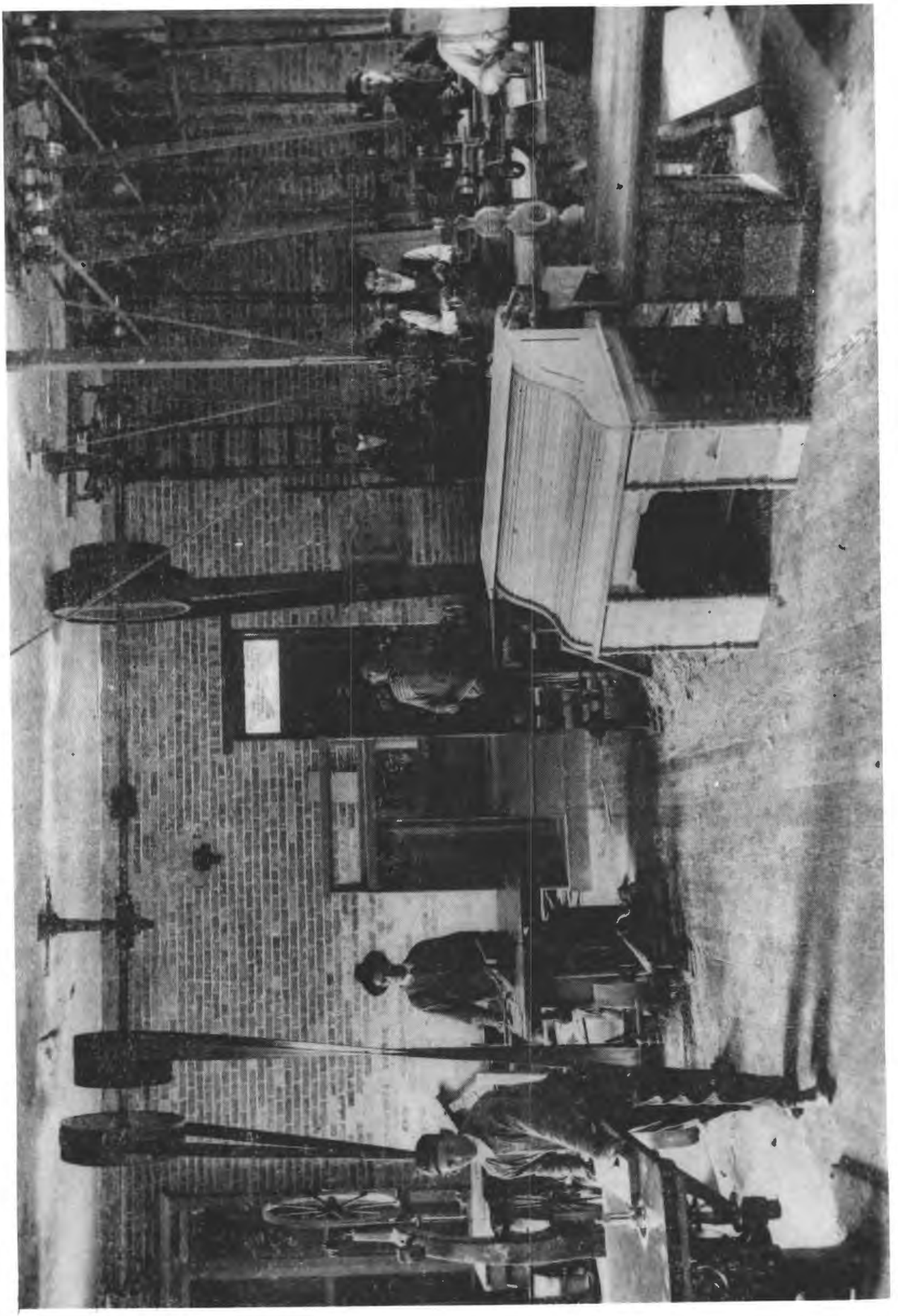
The number of students who have received grades in this department from its beginning to and including 1952, is 6,612.[3]

Machine Work

This department has been known also as Machine and Automobile Work, Metalwork, Metalwork and Machine Shop, and Metalwork and Mechanical Drawing. It was one of the original three departments in Mechanic Arts, and early catalogues used many pictures of the shops in their appeal to students. The most obvious thing about the history of this department has been the consistency with which it has absorbed new work and adjusted to the fluid needs of progressively more complicated industry. Course work expanded dramatically with each new demand for trained men in such fields as automobile work, tool making, tractor and farm machinery repair, sheet metal work, art metal work, plastics, and welding. The nature of this expansion is noticeable at once from the department listings that follow.

The Machine Work department remained under this designation from its

3. From Instructors' Reports in the Registrar's office.



Woodwork Class in Action

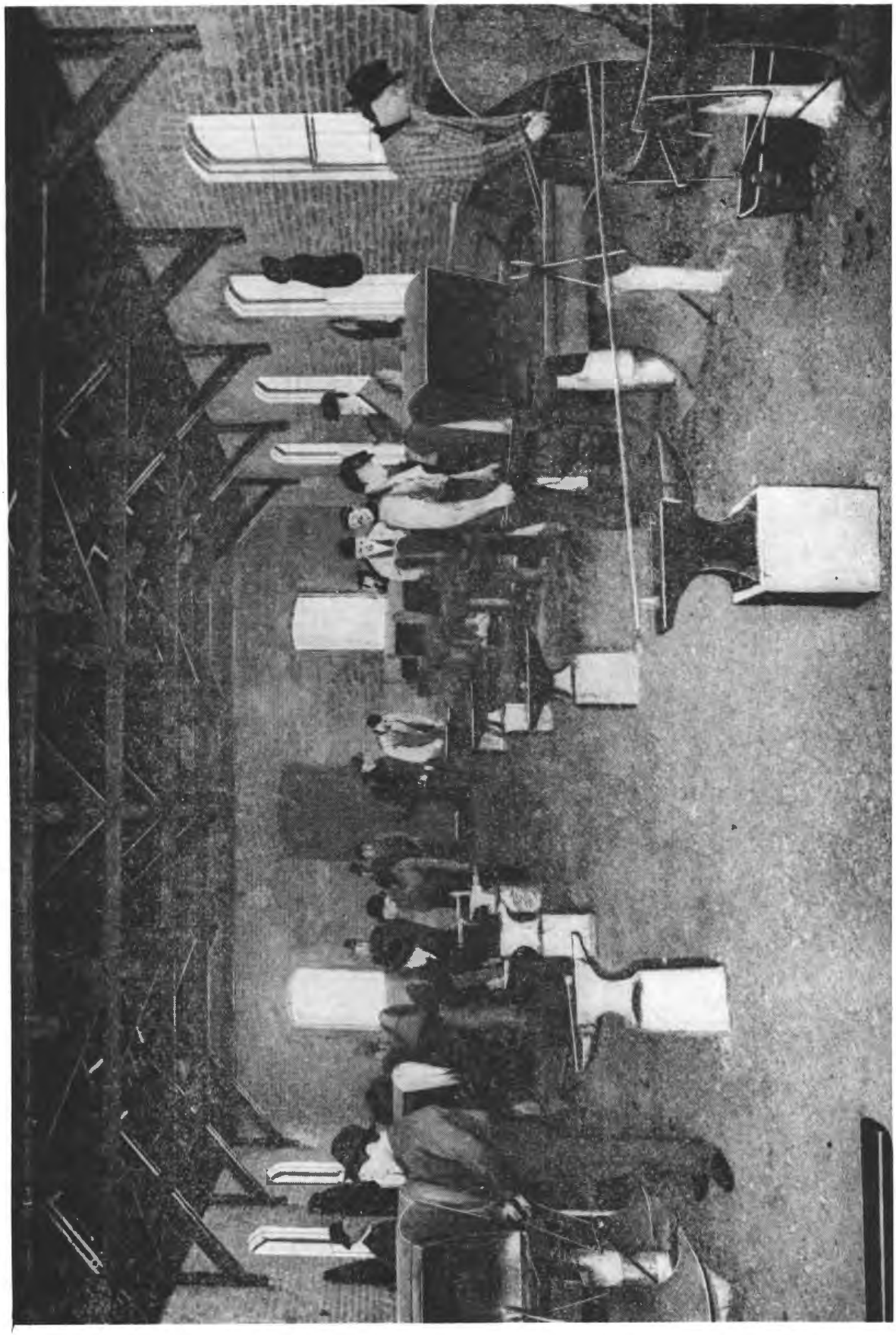
beginning until the year following the introduction of the first classes in automobile work. In 1915-16 it became known as the Machine and Automobile Work and remained thus until 1927-28, several years after the automotive work was placed largely in separate departments. In 1928-29 the original title of Machine Work was revived and remained until the work was combined with Forging in 1937-38 and called the department of Metalwork. In 1938-40 the title was changed to Metalwork and Machine Shop for apparently inexplicable reasons.

In 1940-41 the work in Mechanical Drawing, which had been shunted about for many years between Engineering and Mechanic Arts, was placed in the department, the name of which then became Metalwork and Mechanical Drawing. In 1951-52 the department was divided and placed in the Division of Engineering and listed separately in two departments--Tool Engineering and Engineering Drawing. The new Engineering Drawing department was composed of courses taken from both the Civil Engineering and the Metalwork and Mechanical Drawing departments.

Forging

The earliest classes in forging were listed (though no instructor was provided) when the college first opened its doors for instruction in 1890, and were given as a proposed offering in the Mechanical Engineering work. Classes were listed as Shop Work, a part of which was forge practice. In 1892-93 the catalogue announced that 24 power-blast forges with anvils, vises, and tools, were available for the work, and the catalogue for the following year published a sketch of the Forge room.[4] In 1894-95 the classes were actually called Forge Work in the list of

4. General Catalogue for 1892-93, p. 47.



Earl Class in Forging

offerings for freshmen in Mechanical Engineering.

In 1895-96, when Mechanic Arts was first used as a designation and classes were listed separately under that heading, there were classes in Iron Foring and Steel Forging as a part of the freshman shop work program. This pattern continued until 1901-02 when Forging became a separate division, taught by Mr. Griffin, under Mechanic Arts. It is not possible to tell whether it was considered a department, since Mechanic Arts itself was listed merely as one of the department of instruction. Forging appears to be simply a subdivision, along with Carpentry and Machine Work.

In 1906-07 Engineering and Mechanic Arts were listed as a single department (no doubt because the State Legislature passed a law prohibiting the college from teaching courses in Engineering as such), and Forging automatically became a subdivision of this double department with no change of status or designation. The following year Mechanic Arts was once more listed as a separate department, and Forging was now called Forging and Carriage Building.

When all the subdivisions became departments in 1913-14 with the official designation of Mechanic Arts as a School, Forging was listed as a department of Forging and General Blacksmith, with carriage work reduced to a part of one class. It should be noted that in 1917-18 the Forging and General Blacksmithing department began teaching classes in "Carriage and Automobile Work" and "Automobile Repairs". The latter class continued to be taught here even after most of the automobile work went into a department of its own.

The term "blacksmithing" was dropped, and Forging became a part of the work in Metalwork and Mechanical Drawing in 1936-47. It was then

temporarily a part of the Automotive department from 1942-43 to 1947-48, when it was listed once more under Metalwork and Mechanical Drawing. There it remained until 1951-52, at which time it was shifted to Agricultural Engineering.

The foundry. The first request for a foundry was made by Director Joseph Jenson in 1898 and again in 1899-1900, because molding and casting of iron was so essential to machine work and construction. The department was constantly being called upon to provide men trained to do such work, for casting had become an important industry in the State. A small foundry, said Mr. Jenson, would greatly aid the work in Manual Training and would cost about $3,000. A building was constructed and ready for use in 1903, the same year as the carriage shop was built, and course work was offered in the 1903-04 catalogue. Actually, no regular courses were ever taught, according to Mr. Newey, who, along with Mr. Powell and Mr. Behring, gave most of the demonstrations in casting during the entire history of the plant. Work was confined almost entirely to these demonstrations (given irregularly) and to making castings for the use of other departments in the college. This gratis activity, says Mr. Newey, was similar to what was known in the Old Country as "working for the Queen".

The men in charge of the foundry work felt compelled from time to time to justify its existence by pointing out how much more the castings would cost if they were purchased outside the college. Its service to other departments was often mentioned, and in 1923-24 Mr. Powell called the attention of the president to the fact that in the previous two years the foundry had made 12 tons of castings at a cost of about $4 per hundred which would have cost $9 per hundred anywhere else. These

justifications of the work generally accompanied requests for money to purchase additional supplies.

The first cupola for melting metals was an extremely large one, designed and put up by Mr. Jenson. After the fire of 1905, which the foundry escaped, this cupola was redesigned and a smaller one put in. The building was never adequately heated, though several requests were made over the years to have the place steam heated. Even after this was provided, most of the heat had to be supplied from the cupola, just as the forges supplied most of the heat for that section of the building. Heat, of course, was a matter of small consequence, since very few students did any work in the foundry, confining themselves largely to watching the infrequent demonstrations.

The first offering in Foundry Work was given with considerable promise and was listed as a separate division (with two classes) under Mechanic Arts. Thus it remained until 1913-14, when it was listed as a class (but not offered) under Machine Work. The next year it was listed as a class in Forging and General Blacksmithing, with the statement that the foundry was operated for the purposes already mentioned, and that if enough students applied, it would be run for instructional purposes also. It remained a part of the above department until Forging was reduced to a part of the Metalwork and Mechanical Drawing department in 1936-37. Foundry Work was then placed under the department of Auto Mechanics, Internal-Combustion Engines, and Welding in 1938-39, where it quietly died in 1939-40 after a kind of orphan-like history. The foundry room was used for several years for automotive work and at present houses the acetylene welding equipment.[5]

5. Most of this information was supplied verbally by Mr. Newey.

Automotive

The first classes dealing with the automobile were taught in the department of Forging and General Blacksmithing as early as 1917-18. In 1919-20, at the time when the demand was strong for vocational courses, particularly for veterans of World War I, the department of Farm Mechanics and Automobiles was set up to take care of the rapidly expanding work. This name was changed to Farm and Auto Mechanics in 1920-21, at the same time as the first class was offered dealing with Starting, Lighting, and Ignition work, that was later put into a subdivision of its own. In 1922-23 all the courses were listed under the department of Auto Mechanics, but a separate designation was made for Ignition, Starting, and Lighting. The general heading for the department varied from time to time thereafter as Farm and Auto Mechanics (1923-24 to 1926-47, inclusive), Auto Mechanics (1927-28), Auto Mechanics and Welding (1934-35 and 1935-36), Auto Mechanics, Internal Combustion Engines and Welding (1937-38 and 1938-39), and Auto Mechanics and Engines (1939-40). From 1940-41 to 1948-49 the title was simply Automotive. Since then it has been listed as Automotive Technology.

This department has naturally been one of the most rapid-growing ones in the industrial field, and it has offered a great variety of work during its history, from "Ignition Trouble Work" and "Vulcanizing and Tire Repair" to "Air Conditioning" and "Household Refrigeration".

It should be noted that the class numbers on many of the offerings listed for 1940-41 have combination number and letter designations. In the following year all the class sections with the letter "b" appended were dropped.

Radio

The department of Ignition, Starting, and Lighting, which was an outgrowth of the department of Farm and Auto Mechanics in 1927-28, became the department of Ignition, Starting, Lighting, and Radio in 1929-30 when three classes in radio work were offered for the first time. In 1930-31 classes were added in aviation work, but no change was made in the name of the department. In 1933-34, however, the name became Automotive Electricity, Radio, and Aviation. The greatest expansion in the department from then until 1940-41 was through radio work, which even included broadcasting and motion picture problems.

In 1938-39 the Automotive Electricity courses were shifted to the department of Auto Mechanics, Internal Combustion Engines, and Welding, leaving Aviation and Radio in combination as a department. In 1941-42 the aviation classes went into a separate department of Aeronautics, though the title, Aviation and Radio, was not changed until 1942-43, apparently an oversight, since no aviation classes were listed.

The name "Electronics" was added in 1947-48 to make a department of Radio and Electronics. Thus it remained until 1951-52, at which time the department was listed in the Division of Engineering and was called Electrical Engineering.

Industrial Education

The work of this department concerns itself largely with the problems of teaching, and some of its courses were first taught in the School of Education. In 1940-41, when the Industrial Division was first so called, Industrial Education became a department therein and offered its own complete curriculum, known at first as Professional Education Courses under

Industrial Arts. One of the objectives of the Industrial Division was to provide teacher training in the field of trades and industries. Curricula were provided for the student who wished to work toward either the Bachelor of Science or an advanced degree. Both Master of Science and Master of Education degrees were available in Industrial Education.[6] Not until 1942-43 was ther an officially designated department of Industrial Education in the catalogue, however. Students who wished to get a Bachelor of Science degree in the field majored in either Industrial Arts or Trades and Industries and took additional courses in Industrial Education offered jointly by the School of Education and the Industrial Division. The division now teaches most of the courses required for the Bachelor's degree in Industrial Education, except those that fill the regular group requirements.

The department also includes the courses in Photography, for reasons that are not known to the writer.

Aeronautics

The first courses in this field were listed rather too optimistically in 1917-18 under Technology of Mechanic Arts. Demand must have been negligible, for the work was dropped after 1919-20, when one class was offered, and was not offered again for a decade. Courses were again offered in 1930-31 in the department of Ignition, Starting, Lighting, and Radio. In 1933-34 the department was known as Automotive Electricity, Radio, and Aviation, then in 1938-39 as Aviation and Radio. The greatest development in the field naturally came in the years after the outbreak of World War II. Aeronautics expanded to the point where it became a

6. Cf. General Catalogue for 1940-41, p. 134.

separate department in 1941-42, though certain courses continued to be taught that year under the still existent Aviation and Radio department, until Radio also became a separate department in 1942-43.

Air Conditioning and Refrigeration

This type of work entered the curriculum through the department of Auto Mechanics, Internal Combustion Engines, and Welding in 1938-39, though no class is actually listed in the catalogue. Professor E. A. Call taught a class of seven students under the title of "Air Conditioning and Refrigeration".[7] No class was offered again until 1946-47, when a full-fledged department headed by J. Cecil Sharp was opened for the purpose of training skilled technicians to meet the needs of industry, national societies, and domestic and commercial users of refrigeration and air conditioning apparatus.

Welding

Welding classes were naturally among the early ones taught in connection with the work in Forging. The first forge-welding class, taught in 1901-02, was known as "Practice in Steel and Iron Welds", with only the descriptive title. The first classes in oxy-acetylene welding were given in the Farm and Auto Mechanics department in 1920-21. First arc-welding classes were listed in 1922-23 under Auto Mechanics. Welding classes moved into the department of Ignition, Starting and Lighting in 1927-28, then to Auto Mechanics and Welding in 1934-35. From there the classes went into the department of Metalwork and Mechanical Drawing in 1947-48. There it remained until 1951-52 when it became known as the Welding department.

7. Cf. Intructors' rolls in the Registrar's office.

For enrollment figures by year and department since 1937-38, when all departments were first listed with sufficient distinctness to make the figures meaningful, see Appendix C. For a summary of the Division history through the addition of new programs and departments, see Appendix B. For a record of new classes that have been added from year to year, see Appendix D. For the names of individual instructors who have handed in grades, see Appendix E. This list includes visiting professors, student instructors, and regular staff members. It does not include per diem instructors hired in the military training program.

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APPENDIX A

BOARD OF TRUSTEES MINUTES

Course in Mechanic Arts

The proposed course would be as follows (1896):

sub-Freshman Year

The figures denote the number of recitations or the hours of laboratory practice in each week.

First Term		Second Term		Third Term	
Grammar	5	Grammar	5	Grammar	5
Arithmetic	5	Arithmetic	5	Arithmetic	5
Physical Geo.	4	U.S. History	3	U.S. History	3
Indus. Dwg.	6	Indus. Dwg.	7	Indus. Dwg.	7
		Afternoon Work			
Joinery & Turning	5	Cabinet Making	10	Pattern Making	10
		Freshman Year			
Higher grammar	5	Rhetoric	5	Literature	5
Plane Geometry	5	Algebra	5	Algebra	5
El. Physics	3	El. Physics	3	El. Astronomy	3
Mech. Dwg.	7	Mech. Dwg.	7	Mech. Dwg.	10
		Afternoon Work			
Chipping and filing	10	Forge Work	10	Foundry Work	10
		Sophomore Year			
Chemistry	3	Chemistry	3	Chemistry	3
Arg.Rhetoric	2	Arg.Rhetoric	2	Geometry of Mach.	3
Solid Geometry	3	Trig	5	Surveying	2
Higher Algebra	6	—	—	Mechanics	5
Mech. Dwg.	10	Mech. Dwg.	10	Mech. Dwg.	7
		Afternoon Work			
Machine Work	6	Machine Work	6	Machine Work	4
Physical Meas.	4	Physical Meas.	4	Mechanics Surveying	2

APPENDIX B

CHANGES AND ADDITIONS IN DEPARTMENTS, NOMENCLATURE, ETC.

1890-91
All courses under Mechanical Engineering

1895-96
Mechanic Arts listed as a separate field of instruction

1901-02
Mechanic Arts subdivided into three areas: Carpentry, Forging, and Machine Work

1903-04
Foundry and Sloyd courses added

1905-06
Technology added

1907-08
Forging called Forging and Carriage Building

1911-12
Mechanical Drawing classes added to Technology
Carpentry called Wood Work, with subdivision called Wood Carving
Horse Shoeing classes added

1913-14
First called the School of Mechanic Arts
Technology dropped out
Foundry Work became a part of Machine Work department
Carriage Work became a part of Forging and General Blacksmithing

1915-16
Department of Technology of Mechanic Arts restored
Machine Work became Machine and Automobile Work
Wood Work became Woodwork and House Building
The Foundry was put in the Forging and General Blacksmithing department

1917-18
Technology of Mechanic Arts expanded to include Wood Finishing, Automobiles, Shop Problems, and Aviation and Aeronautics

1919-20
Department of Farm Mechanics and Automobiles (not under Mechanic Arts)

1921-22
Automobile Work dropped from Machine and Automobile Work department
Harness Repairing listed as a vocational offering (no department)

1922-23
Auto Mechanics and Farm Mechanics listed as two separate departments (not under Mechanic Arts)

1923-24
Farm and Auto Mechanics listed as a department in the School of Mechanic Arts, with subdivisions for specializing in: Auto Mechanics; Farm Mechanics; Ignition, Starting and Lighting; Oxy-acetylene, Electric Arc, and Resistance Welding; Tractor Repair and Operation; or Vulcanizing and Tire Repair
Harness Repairing dropped

1927-28
Mechanical Drawing work went into Engineering
Farm Shop courses added as a division under Woodwork
Mechanic Arts listed as a part of the School of Engineering

1928-29
Woodwork and House Building became simply Woodwork

1929-30
Radio was added to Ignition, Starting, and Lighting

1930-31
Aviation courses re-introduced (last taught in 1917-18)

1931-32
Aviation Ground School work included under Aviation

1933-34
Automobile Electricity, Radio, and Aviation grouped together

1934-35
All departments throughout the college listed alphabetically in the catalogue

1937-38
Work of departments once more listed under Mechanic Arts
Two-year Certificate offered in non-collegiate work
Auto Mechanics, Internal Combustion Engines, and Welding grouped as a department
Machine Work became the Metalwork department

1938-39
Aviation and Radio became a single department
Automotive Electricity work went into Auto Mechanics, Internal Combustion Engines, and Welding
Trades Courses, or Non-Collegiate section of Mechanic Arts, added

1939-40
Metalwork department became Metalwork and Machine Shop
Department of Auto Mechanics, Internal Combustion Engines, and Welding became Auto Mechanics and Engines
Woodwork became Woodwork and Building Construction

1940-41
- Mechanic Arts first known as the Industrial Division
- Industrial Arts a sub-designation or subdivision
- Automotive became a separate department
- Mechanical Drawing brought back as a part of the department of Metalwork and Mechanical Drawing
- National Defense program started

1941-42
- Aeronautics became a separate department
- Civilian Pilot Training Ground School still listed under Radio and Aviation

1942-43
- Civilian Pilot Training Ground School listed under Aeronautics
- Radio listed as a separate department

1945-46
- First Industrial Education program officially listed, along with Trades and Industrial Education program (first referred to in 1940-41)
- Four-year Technical Institute Program started

1946-47
- Aeronautical Flight School started
- Industrial Education classes listed as such in a group for the first time

1947-48
- General title became the Division of Technology
- Aeronautical Ground School and Flight School combined
- Air Conditioning and Refrigeration department added
- Radio became Radio and Electronics
- Commercial Photography classes were listed under Industrial Education
- Title of the Technical Institute (1945-46) changed to Vocational Technical Program

1949-50
- Automotive department became Automotive Technology

1951-52
- Welding became a separate department
- Radio and Electronics, Metalwork and Mechanical Drawing, and Forging went into the Division of Engineering

APPENDIX C

Table 2. Enrollment in classes conducted by departments in Division of Technology, 1937 to 1952, inclusive [1]

Year	Welding	Air Conditioning & Refrig.	Industrial Edu.	Aeronautics	Radio	Automotive	Metalwork & Mech. Dwg.	Woodwork & Bldg. Const.
1937-38	[6]	[5]	[4]	[3]	454	236	298	202
1938-39	[6]	[5]	[4]	[3]	393	366	311	242
1939-40	[6]	[5]	[4]	[3]	713	458	436	539
1940-41	[6]	[5]	164	298	707	370	456	564
1941-42	[6]	[5]	37	157	610	227	292	215
1942-43	[6]	[5]	2	164	253	71	124	111
1943-44	[6]	[5]	35	22	60	16	14	68
1944-45	[6]	[5]	68	91	56	61	17	123
1945-46	[6]	[5]	142	223	234	672	322	443
1946-47	[6]	[5]	269	661	616	1362	897	757
1947-48	[6]	338	552	327	823	554	1227	803
1948-49	[6]	493	859	330	773	763	1245	753
1949-50	[6]	345	1286	324	579	766	623	826
1950-51	[6]	95	1026	308	435	565	912	559
1951-52	328	63	860	344	[2]	515	[2]	408
Total	328	1334	5322	3249	6707	6998	7144	6612

[1] Figures are from the teachers' rolls handed to the Registrar's office.
[2] Moved to Division of Engineering.
[3] Aeronautics was part of the Radio department.
[4] Industrial Education was not organized at this time.
[5] Air Conditioning and Refrigeration was taught in the Automotive department.
[6] Welding was taught in the Automotive department up to 1947-48; then it went into the department of Metalwork and Mechanical Drawing; there it stayed until 1951-52 when it became a department of its own.

APPENDIX D

GROWTH OF INDIVIDUAL DEPARTMENTS THROUGH ADDITION OF CLASSES

1. Mechanic Arts (General)
2. Woodwork and Building Construction
3. Machine Work
4. Forging (including Foundry)
5. Automotive
6. Radio
7. Industrial Education
8. Aeronautics
9. Air Conditioning and Refrigeration
10. Welding

Mechanic Arts
(General)

Foundry Work - 1905-06

1. Practice in moulding and general foundry work
2. Special moulding

Sloyd

1. (a) Simple household and school-room articles
   (b) Elementary turning and scrolling

Technology - 1906-07

1. Required of all second year students in the manual training course in mechanic arts
2. The aim of this course is to give the student a practical knowledge of the various forms of motion
3. In this course consideration is given to plane specifications and details of wooden buildings

Technology - 1907-08

1. The properties and characteristics of the materials used in construction

Technology - 1911-12

1. Materials
3. Advanced materials
4. Properties and characteristics of materials

Shop Mathematics

1. Application of mathematics to solutions of shop problems
4. Review of preceding year's work, and solution problems

Horse Shoeing

2. Elementary practice in making shoes, preparing hoof, and fitting; and study of horse anatomy; repairing farm tools; making set of farrier's tools
3. Advanced horseshoeing
4. Application of principles learned to actual work of horseshoeing

Technology - 1912-13

4. Shop theory
5. Strength of materials

1915-16

1. A survey of the trades
2. Mechanism
3. Automobiles

Technology of Mechanic Arts - 1917-18

8. Aviation and aeronautics

1921-22

A. Harness Repairing

Mechanic Arts (General) (cont'd)

Mechanic Arts - 1937-38
91, 92, 93. Shop drawing
94. Working drawings and specifications
106. Machine design

Mechanic Arts - 1938-39
48. Principles of industrial education
49. History of Industrial education

Woodwork and Building Construction

Carpentry 1901-02

1. (a) Rudimentary exercises in sawing, ripping, planing, etc.
   (b) Sharpening and adjusting carpenter's tools

Second year students in the manual training course in mechanic arts

2. (a) Plain cabinet making
   (b) Wood turning
3. Frame house building
4. Cabinet making
5. Selected exercises from courses 1(a) and 2(b)

Carpentry 1909-10

4. Students specialize in cabinet making, or inside finishing of houses

Wood Work 1913-14

a. Fundamental Principles
b. Application of Fundamentals
1. The Work Bench
2. Turning
3. Hard Pine
4. House-building or Hardwood Work
5. Veneering
6. House Finishing or Fancy Woodwork
7. Pattern Making
8. Carving

Woodwork 1914-15

3. Machine Work
5. Cabinet Making and House-building
7. Fancy Cabinet Making or Interior Finishing
(a) Short Course
(b) Advanced Short Course

Woodwork and Housebuilding 1915-16

6. Continuation of Course 5

Woodwork and Housebuilding 1917-18

(e) Carpentry Short Course for beginners
7, 8, 9. Fancy Furniture

Woodwork and Housebuilding 1918-19

(d) Farm Carpentry
12. Carpentry - Advanced Short Course

Woodwork and Housebuilding 1919-20

13. Picture Framing
14. Wood Finishing

Woodwork and Building Construction (cont'd)

Woodwork and Housebuilding 1922-23
(b) Panels, Sashes, Doors and Rafter Cutting
(c) Feedhoppers, Trestles, Gates, etc.

Woodwork and Housebuilding 1923-24
1. Elementary Woodwork
10. Farm Woodwork

Woodwork and Housebuilding 1926-27
Farm Shop Course

Unit C
10. Farm Woodwork
11. Wood Carving
101, 102, 103. Advanced Woodwork

Woodwork 1928-29
64, 65, 66. Mill Work
168. Smith-Hughes Course

Woodwork 1931-32
164. Fundamentals of Patternmaking

Woodwork 1933-34
69. General Woodwork

Woodwork 1934-35
170, 170b. Advanced Wood Turning
171. Advanced Wood Carving

Woodwork 1937-38
64, 65b, 64b, 65. Joinery and Millwork
171, 172, 173. Cabinet Work
174, 175b, 174b, 175, 176, 177b, 176b, 177. Cabinet Work
178, 179b, 178b, 179. Cabinet Work

Woodwork 1938-39
70. Art Leather Work
71. Wood Finishing and House Decorating
72. Concrete and Clay Products
73. Materials of Industry

Woodwork and Building Construction 1939-40
6, 7, 8. Shop Problems

Woodwork and Building Construction 1940-41
174. Art Woodwork

Woodwork and Building Construction 1941-42
60. Elements of Plumbing
161, 162, 163. Building Construction, Estimating and Contracting

Woodwork and Building Construction 1942-43
68. House Wiring

Woodwork and Building Construction 1943-44
74. Home Service Course

Woodwork and Building Construction 1947-48
67. Woodwork for Engineers

Machine Work

Machine Work 1901-02

1. Special work in filing, chipping, etc.

Second year students in the manual training course in mechanic arts

2. (a) Preliminary exercises in straight and taper turning
   (b) Boring and chucking in the lathe

Third year students in the manual training course in mechanic arts

3. (a) Making taps, spiral drills, etc.
   (b) Manufacture of parts of machinery
4. Actual machine construction

1907-08

3. (a) The work of this course is principally that of making mandrels, etc.
   (b) Practice in making fluted reamers, etc.

Machine Work 1909-10

1. (a) Elementary forging, concluding with the making, dressing and tempering of lathe and planer tools
   (b) Preliminary exercises
2. (a) Exercises
   (b) Manufacture of gear wheels, shaft-couplings, jack-screws, tap wrenches, eccentrics, cranks for steam engines, etc.
3. (a) Making engine connecting rods, mandrels, etc.
   (b) Practice making fluted reamers, grinding, etc.
4. Actual machine construction, factory methods emphasized

Machine Work 1911-12

3. Building machine tools and parts

Machine Work 1913-14

a. Bench Work
b. Bench, Planer and Shaper Work
1. Planing and Turning
2. Advanced Lathe Work
3. Turning and Milling
4. Tool Making
5. Tool Making (continued)
6. Machine Construction
7. Elementary Machine Design
8. Machine Design (continued)

Machine Work 1914-15

A. Short Course
B. Advanced Short Course

Machine Work (cont'd) 1914-15
1. Bench and Vise Work
2. Bench, Planer and Shaper Work
3. Lathe and Milling Machine Work
4. Lathe and Advanced Milling Work
5. Automobile Work
7. Advanced Tool Making

Machine and Automobile Work 1915-16
5. Automobile Repair
6. Automobile
C. Short Course
D. Advanced Short Course

Machine and Automobile Work 1917-18
3. Lathe and Auto Repair
5. Lathe and Milling Machine
7. Milling and Grinding
9. Tool Making and Press Work

Machine and Automobile Work 1918-19
7, 8, 9. Lathe and Milling Machine Work
1. Automobile Laboratory Work
2. Auto and Tractor Repair
3. Short Auto and Tractor Repair Course

Machine and Automobile Work 1919-20
F. Care of Farm Machinery
13. Materials of Machines

Machine Work 1921-22
A, B, C. Machine Shop Practice
1a, 1b, 1c. General Machine Work
2a, 2b, 2c. Tool Making

Machine Work 1928-29
155. S. H. Teachers Machine Course

Machine Work 1933-34
54, 55, 56, 57, 58, 59. M.S.P. Short Course
157. Smith-Hughes Teachers' Machine Course

Metalwork Department 1937-38
30. Teachers' Metal Course
31, 32, 33. Forge Practice[1]
34, 35b, 34b, 35. Forge Practice
36, 37b, 36b, 37. Forge Practice
38, 39b, 38b, 39. Forge Practice
50. Metals and Heat Treatment
90. Sheet Metal Work
181, 182, 183. Tool and Die Making

1. Forging operated on its own budget, however, until it was transferred to Engineering in 1951-52.

Metalwork Department 1938-39
41. Ornamental Metalwork

Metalwork and Machine Shop 1939-40
35. Elements of Plumbing
40. Sheet Metal
91, 92, 93. Shop Drawing
94. Working Drawings and Specifications

Metalwork and Mechanical Drawing 1940-41
41. Art Metalwork
42. Plastics Laboratory
95. Machine Drafting

Metalwork and Mechanical Drawing 1941-42
96. Aeronautical and Machine Drawing

Metalwork and Mechanical Drawing 1946-47
96. Aircraft Drawing and Blue Print Reading

Metalwork and Mechanical Drawing 1947-48
41, 41a. Acetylene Steel Welding[2]
42, 42a. Acetylene Cast Iron Welding
43, 43a. Acetylene Aluminum Welding
44, 44a. Electric Steel Welding
45, 45a. Electric Cast-Iron Welding
46, 46a. Electric Aluminum Welding
91, 91a. Acetylene Welding
92. Aero Welding
94. Electric Welding
96. Engineers Welding Laboratory
190. Advanced Acetylene Welding
191. Advanced Electric Welding
193. Welding Seminar

Metalwork and Mechanical Drawing 1948-49
57. Precision Inspection
58. Manufacturing Processes
153. Tool Work

Metalwork and Mechanical Drawing 1949-50
194. Mechanical Perspective
195. Industrial Production Illustration
185, 186. Cooperative in Plant Training

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2. Welding has operated on its own budget since this time, even though it did not become a separate department until 1951-52.

Forging

Forging 1901-02

Second year students in the manual training course in mechanic arts

1. (a) Preliminary exercises
   (b) Practice in steel and iron welds

Third year students in the manual training course in mechanic arts

2. (a) Elementary work in horseshoeing and spring building
   (b) Filing, chipping, hand fitting, etc.
3. Practical carriage building and advanced forging
4. (a) Selected exercises from course 1, etc.
4. (b) Selected exercises from course 1(a), etc.

Forging 1906-07

Open to first year students in the manual training course in mechanic arts

1. (a) Preliminary exercises
   (b) The work in this course consists of practice in steel and iron welds
2. Open to second year students in the manual training course in mechanic arts

Forging and Carriage Building 1908-09

(b) A continuation of horseshoeing
3. Advanced horseshoeing
4. A series of selected exercises

Forging and Carriage Building 1911-12

1. Elementary forging with exercises arranged to illustrate fundamental principles
3. Woodwork preparatory to carriage building
4. Advanced carriage work; construction of approved vehicle

Forging and General Blacksmithing 1913-14

C. Exercises from Course A
1. Exercises from Courses A and B
3. General Repair Work
5. Building of approved vehicle or farm implement

Forging and General Blacksmithing 1914-15

2. Special Forge Shop Operations
3. Advanced Forging
5. Repair Problems
6. Repair Work
A. Short Course
B. Advanced Short Course

Forging and General Blacksmithing 1917-18
7, 8, 9. Carriage and Automobile Work
7, 8, 9. Automobile Repairs

Forging and General Blacksmithing 1920-21
6. Shop Problems
2a, 2b, 2c. Advanced Shop Practice

Forging and General Blacksmithing 1923-24
7, 8, 9. Select work from Forge Practice 1, 2, 3
100, 101. Advanced Shop Practice

Forging and General Blacksmithing 1924-25
11, 12, 13. Farm Shop Work

Forging and General Blacksmithing 1926-27
101. Smith-Hughes Unit, Metal Work

Forging and General Blacksmithing 1927-28
133. Foundry

Forging and General Blacksmithing 1928-29
134. Smith-Hughes Course

Forging and General Blacksmithing 1931-32
43. Fender and Body Repair

Automotive

Farm Mechanics and Automobiles 1919-1920

a. Automobile and Tractor Course
b. Advanced Auto Repair
c. Automobile Electrical Course
d. Two weeks short course in tractors during winter quarter

Junior College Courses

1. Farm Machinery
2. Farm Motors

Senior College Courses

3. Applied Farm Mechanics
5. Advanced Farm Motors

Farm and Auto Mechanics 1920-21

a, b, c, i, w. Offered with a view of fitting men to become efficient auto and farm mechanics
b. Storage Battery Repair
i, 1. Auto Starting, Lighting and Ignition
2. Oxy-acetylene Welding

Auto Mechanics 1922-23

a. Automobile Design and Construction
b. Automobile Design and Construction
c. Automobile Care and Maintenance
d. Vulcanizing and Tire Repair Work
e. Vulcanizing and Tire Repair Work
f. Gasoline Traction Engine Design and Construction
g. Gasoline Traction Engine Design and Construction
h. Gasoline Traction Engine Operation and Repairs
i. Gasoline Engine Carburetion and Carburetors

Ignition, Starting and Lighting

j. Elements of Electricity and Magnetism
k. Storage Batteries
l. Ignition, Starting and Lighting
m. Ignition Trouble Work
n. Oxy-acetylene Welding

Junior College Courses

1. Automobile Repair
2. Automobile Repair
4. Gas Tractor Overhauling
5. Gas Tractor Repair
7. Storage Batteries

8. High Tension Magnetos and Battery Ignition System
9. Starting and Lighting Systems
10. Oxy-acetylene Welding and Electric Welding

Senior College Courses

101. Motor and Generator Repair
103. Automobile Repair
106. Automobile Repair
106. Tractor Repair and Operation

Farm and Auto Mechanics 1923-24

1. Automobile Design and Construction
2. Automobile Design and Construction
3. Automobile Care and Maintenance

Senior College Courses

105. Automobile Repair
106. Automobile Repair
107. Gasoline Engine Carburetion and Carburetors

Farm Mechanics

8. Farm Mechanics
9, 10, 11. Farm Motors
12, 13. Farm Repair Work

Senior College Courses

114. Farm Machinery

Ignition, Starting and Lighting

15. Elements of Electricity and Magnetism
16. Ignition, Starting, and Lighting
17. Storage Batteries
18. High and Low Tension Magnetos
119. Ignition Trouble Work
120. Starting, Lighting and Ignition Systems
121. Motor and Generation Repair and Armature Winding

Oxy-acetylene, Electric Arc, and Resistance Welding

Junior College Courses

22. Oxy-acetylene Welding
23. Oxy-acetylene, Electric Arc, and Resistance Welding

Tractor Repair and Operation

Junior College Courses

24. Gasoline Traction Engine Design and Construction
26. Gasoline Traction Engine Operation and Repairs (special)
27. Gasoline Tractor Overhauling

Senior College Courses
128. Gasoline Tractor Overhauling
129. Tractor Repair and Operation

Vulcanizing and Tire Repair

Junior College Courses
30. Vulcanizing and Tire Repair
31. Vulcanizing and Tire Repair

Farm and Auto Mechanics 1924-25
110. Storage Battery Repair and Shop Management
111. Automotive Electrical Equipment and Shop Management

Farm and Auto Mechanics 1926-27
5. Automobile Care
119. Starting, Lighting and Ignition Systems

Auto Mechanics 1927-28
5. Automobile Care, Adjustment and Lubrication

1930-31
1. Principles of Automobile Construction and Operation
2. Principles of Automobile Construction and Operation
104. Farm Machinery Research

Auto Mechanics and Welding 1934-35
21. Oxy-acetylene and Electric Welding

Auto Mechanics and Welding 1935-36
80. Diesel Engines
112b. Alternating Current Machinery

Auto Mechanics, Internal Combustion Engines and Welding 1937-38
3. Automobile Inspection and Tune-Up
4. The Automobile Engine Reconditioning
81. Diesel Engine Overhauling
82. Fender and Body Work
101. Garage Practice
122. Spring-Oxy-acetylene and Electric Welding

Auto Mechanics, Internal Combustion Engines and Welding 1938-39
12. Ignition, Starting and Lighting
13. Foundry Practice
14. Low and High Tension Magnetos
111. Starting, Lighting, and Ignition Systems
112. Motor and Generator Operation and Repair
113. Automotive Electrical Equipment and Shop Management

Auto Mechanics and Engines 1939-40

4. Automobile Driving Mechanism
5. General Short Course in Auto Mechanics
12. Ignition Principles
102. Shop Management and Supervision
113. Special Ignition Systems
114. Motor Analysis and Tune-up
119. Electric Welding

Automotive 1940-41

1, 1a, 1b. Steering Correction
2, 2a, 2b. Automotive Engines
3, 3a, 3b. Driving Mechanisms
4, 4a, 4b. Fuel Systems
5, 5a, 5b. Auto Electrics
6, 6a, 6b. Motor Tune-up
11, 11a, 11b. Chassis Alignment
12, 12a, 12b. Fender Reconditioning
13, 13a, 13b. Body Reconditioning
14, 14a, 14b. Body Mechanism
15, 15a, 15b. Automotive Trimming
16, 16a, 16b. Automotive Refinishing
41, 41a, 41b. Fusion Welding
42, 42a, 42b. Flame Cutting
43, 43a, 43b. Bronze Welding
44, 44a, 44b. Aluminum Welding
45, 45a, 45b. Resistance Welding
46, 46a, 46b. Hard Surfacing
48, 49, 50. Trade Problems
51. Automobile Chassis
52. Automobile Power Plants
53. Automobile Electricity
61. Body and Fender Repair
62. Upholstering
91. Acetylene Welding
151. Carburetion
152. Motors and Generators
153. Megnetos
162. Metal Refinishing
192. Spot Welding

Automotive 1941-42

92. Aero Welding
93. Advanced Aero Welding

Automotive 1942-43

21, 21a. Stationary Diesel Engines
22, 22a. Automotive Diesel Engines
23, 23a. Heavy Duty Drives
31, 31a. Domestic Refrigerators
32, 32a. Commercial Refrigerators
33, 33a. Air Conditioning

Automotive	1946-47
32, 32a.	Domestic Refrigeration, Sealed Types
33, 33a.	Commercial Refrigeration, Single Systems
34, 34a.	Commercial Refrigeration, Multiple Unit
35, 35a.	Air Conditioning, Domestic Types
36, 36a.	Air Conditioning, Commercial Types
37.	Household Refrigeration

Radio

Ignition, Starting and Lighting 1927-28
11. Elements of Electricity and Magnetism
12. Ignition, Starting and Lighting
13. Storage Batteries
14. High and Low Tension Magnetos
111. Starting, Lighting and Ignition Systems
112. Motor and Generator Repair and Armature Winding
113. Ignition Trouble Work
114. Storage Battery Repair and Shop Management
115. Automotive Electrical Equipment and Shop Management

Oxy-acetylene, Electric Arc and Resistance Welding

21. Oxy-acetylene and Electric Welding

Ignition, Starting and Lighting 1928-29
15. Special Course in Ignition, Starting and Lighting for Car Owners

Ignition, Starting, Lighting and Radio 1929-30
11. Elements of Electricity and Magnetism
12. Ignition, Starting and Lighting (special)
13. Storage Batteries
14. High and Low Tension Magnetos
15. Special Course in Ignition, Starting and Lighting for Car Owners
111. Starting, Lighting and Ignition Systems
112. Motor and Generator Repair and Armature Winding
113. Ignition Trouble Work
114. Storage Battery Repair and Shop Management
115. Automotive Electrical Equipment and Shop Management
123. Practical Electricity

Practical Radio Construction and Service

23. Principles and Operation of Radio Receiving Sets
24. Radio Receiving Sets
25. Building and Testing, and Trouble Shooting of Radio Receivers

Oxy-acetylene Electric Arc and Resistance Welding

21. Oxy-acetylene and Electric Welding
22. A Continuation of Course 21

Ignition, Starting, Lighting and Radio 1930-31
26. Aviation Ground School
27. Types of Airplanes, Assembling and Rigging
28. Aviation Engines and Airplane Instruments

Ignition, Starting, Lighting and Radio 131-32
26. Aerodynamics
27. Aviation Engines
28. Avigation and Aerology

Automotive Electricity, Radio and Aviation 1933-34
25. Operation of Alternating Current Receivers
127. Repair and Servicing of A.C. Receivers
128. Short Wave Receivers and Transmitters
129. Operation of Short Wave Transmitters and Public Address Systems

Radio, Aviation and Automotive Electricity 1936-37

Radio

16, 17. International Code Practice
24. Radio Principles
25. Elementary Short Wave Receivers and Transmitters
83. Alternating Current Receiver Principles
84. Elementary Service and Repair
85. Advanced Service and Repair
86. Forest Service Radio
87. Forest Service Radio
88. Forest Service Radio
124. Vacuum Tube Theory and Application
125. Audio Frequency Amplification and Sound System
126. Radio Frequency Amplification and Radio Transmitters

Automotive Electricity, Aviation and Radio 1937-38
24. Radio Receiver Construction
85. Short Wave Receivers and Transmitters
127. Motion Picture Projection Sound and Installation Problems
128. Broadcast and Commercial Transmitters
129. Sound Recording and Studio Technique

Aviation and Radio 1938-39
28. Meterology and Navigation
11. Elements of Electricity and Magnetism
84. Radio Service
123. Practical Electricity

Radio and Aviation 1939-30
11. Essentials of Electricity
86. House Wiring
120. Broadcast and Short Wave Antennas

Radio and Aviation 1940-41
1, 1a, 1b. Audio and Radio Frequency Circuits
2, 2a, 2b. A.C. Receivers
3, 3a, 3b. Superhetrodyne Receivers
10,10a,10b. Auto Radio Receivers
11,11a,11b. Sound Systems
12,12a,12b. High Fidelity and All-Wave Receivers

Radio and Aviation (cont'd) 1940-41
26. Civil Aeronautics Ground School (Aerodynamics)
27. Civil Aeronautics Ground School (continued)
28. Civil Aeronautics Ground School (Meteorology and Navigation)
130. Television and Frequency Modulation

Radio and Aviation 1941-42
23. Radio and Electricity
135. Advanced C.A.A., Restricted Commercial Aircraft, Power Plants and Engines
136. Advanced C.A.A., Restricted Commercial, Aerodynamics, Navigation and Radio

Radio 1942-43
80. Circuit Analysis
84. Instruments and Measurements
120. Antennas

Radio 1944-45
1. Radio circuits
3. Special Radio Receivers and Equipment

Radio 1946-47
80. D. C. Circuits
89. Receivers and Transmitters
110. Communication Circuits
140, 141. UHF Techniques
150. Advanced Laboratory Work
175. Radio Seminar

Radio and Electronics 1947-48
21. Fundamentals of Electricity
81. A.C. Circuits
82. Electron Tubes
160. Industrial Electronics

Radio and Electronics 1948-49
140. UHF Circuits

Radio and Electronics 1949-50
24. Radio Mechanics
142. Television and F.M. Systems
150. Instruments and Measurements

Industrial Education

Industrial Education 1940-41

Industrial Arts

102. Visual Aids
107. Principles and Objectives of Industrial Arts
108. Methods of Teaching Industrial Arts
109. Course Organization
110. Shop Organization and Management
112. Observation and Practice Teaching

Industrial Education 1942-43

Industrial Arts

102. Instructional Aids
113. Driver Education and Traffic Safety

Industrial Education 1945-46

Industrial Arts Technical Courses

42. Plastics
123. Industrial Arts Laboratory

Industrial Arts Professional Courses

107. Principles and Objectives of Industrial Arts
121. Instructor Training (Methods)

Industrial Education 1946-47

Trade and Industrial Technical Courses

61, 61a. Introductory Photography
62, 62a. Industrial Photography
63, 63a. Agricultural Photography
64, 64a. Motion Picture Photography
65, 65a. Portrait Photography
66, 66a. Color Photography

Trade and Industrial Professional Courses

104. Occupational Analysis
201. Administration of Industrial Education
202. Supervision of Industrial Education
210. Diversified Occupations
211. Part Time Education
212. Personnel Relations
216. Related Instruction

Industrial Education 1947-48

Industrial Arts Courses

43. Recreational Crafts
123. Curriculum Problems in Industrial Arts
141. Art Metalwork

Industrial Education Courses

21. Trade Problems
111. The General Shop
121, 221. Methods in Industrial Education
124, 224. History of Industrial Education
253. Coordination in Industrial Education
254. Measurements in Industrial Education
255. Techniques in Writing Instruction Sheets
259. Planning and Equipping Industrial Education Buildings
262. Supervisory Personnel Development Institute
263. Evening School Programs
264. Conference Leading
265. Apprenticeship
267. Reading and Conference
271. Research and Thesis Writing

Commercial Photography
51. General Photography
151. Photographic Problems

Industrial Education 1948-49

Industrial Arts Courses

40. Sheet Metal

Industrial Education Courses

21. Industrial and Labor Relations
167. Special Problems in Industrial Education
190, 191, 192. Advanced Studies under Plan B

Photography

67. Abstract Composition

Industrial Education 1950-51

Industrial Arts Courses

13. Driver Training

Aeronautics

Aeronautics 1941-42

1, 1a, 1b. Aircraft Engines
2, 2a, 2b. Aircraft Engine Fuel Systems
3, 3a, 3b. Aircraft Engine Electrics
11,11a,11b. Aircraft Construction
12,12a,12b. Aircraft Sheet Metal
13,13a,13b. Aircraft Maintenance
101. Introduction to Airplane Design
102. Airplane Structures
103. Advanced Airplane Structures
104. Airplane Design
119. Instruments
120. Introductory Aeronautics
121. Aerodynamics of the Airplane
122. Advanced Aerodynamics
123. Performance Problems of the Airplane
124. Aerial Transportation
125. Air Transport Control
130. Aeronautics Seminar

Aeronautics 1942-43

104. Airplane Construction and Maintenance
121. Theory of Flight
122. Advanced Theory of Flight
161, 162. Model and Wind Tunnel
34. Civil Aeronautics Ground School (Primary) Civil Air Regulations, and Principles and Theory of Flight
36. Civil Aeronautics Ground School (Primary) Meteorology and Navigation
135. Advanced C.A.A., Restricted Commercial Aircraft, Power Plants and Engines
136. Advanced C.A.A., Restricted Commercial, Aerodynamics, Navigation and Radio

Aeronautics 1945-46

5, 5a. Composite Aircraft Structures
6, 6a. All-Metal Aircraft Structures
8, 8a. Aircraft Powerplants
9, 9a. Aircraft Powerplant Accessories
10,10a. Aircraft Powerplant Maintenance
103. Advanced Aircraft Structures
104. Advanced Airplane Design and Construction

Aeronautics 1946-47

37. Private Pilot Certificate
137. Commercial Pilot Certificate
138. Flight Instructor Certificate
139. Instrument Rating
140. Flight Instructor Training
141. Instrument Flying

Aeronautics 1947-48

100. Fundamentals of Turbo-Jet Propulsion
101. Advanced Engine Operation and Performance
105. Aircraft Woods and Plastics
126. Airline Maintenance and Fixed Base Operation
127. Aircraft Communication and Range Techniques
131. Time and Motion Study

Air Conditioning and Refrigeration

Air Conditioning and Refrigeration 1947-48

1, 1a. Domestic Refrigeration, Open Types
2, 2a. Domestic Refrigeration, Sealed Types
6. Household Refrigeration
11,11a. Commercial Refrigeration, Single Systems
12,12a. Commercial Refrigeration, Multiple Unit
21,21a. Air Conditioning, Domestic Types
22,22a. Air Conditioning, Commercial Types
61. Air Conditioning Sheet Metal Work
62. Sheet Metal Work for Building Trades Students
110. Low Temperature Refrigeration
121. Industrial Air Conditioning
150. Electric Motors
151. Air Conditioning Electric Circuits
161. Stokers and Oil Burners
170. Applications of Thermodynamics
190,191,192. Advanced Laboratory Work

Air Conditioning and Refrigeration 1948-49

162. Instrument Technology

Air Conditioning and Refrigeration 1949-50

7. Principles of Refrigeration
31,31a. Refrigeration Tools and Copper Tubing
32,32a. Refrigeration Motors
33. Thermostatic Expansion Valves
34,34a. Design of Commercial Refrigeration Units
41,41a. Fans and Blowers for Air Conditioning
42,42a. Duct Work
112. Advanced Commercial Refrigeration
153. Principles of Electric Circuits
154. Direct Current and Alternating Current Machinery
155. Electrical Control Circuits
161. Stokers and Oil Burners
194. Seminar

Air Conditioning and Refrigeration 1950-51

122. Winter Air Conditioning
123. Economics of Air Conditioning
141. Design of Air Conditioning Systems
172. Problems in Heat Transfer

Welding 1951-52

41,42,43. Acetylene Welding
44,45,46. Electric Welding
91. Acetylene Welding
92,93. Aero Welding
94. Electric Welding
96. Engineers' Welding
153,154,155. Advanced Acetylene Welding
161,162. Advanced Electric Welding
190. Advanced Acetylene Welding
191. Advanced Electric Welding
193. Welding Seminar

APPENDIX E

INSTRUCTORS WHO HAVE REPORTED GRADES

FROM 1890 TO 1952

John A. Yeatman, Instructor of Drawing and in Charge of Shopwork	1891-1893
J. W. Mayo, Instructor in Mechanic Arts	1893-1897
Joseph Jenson, B.S., Professor of Physics and Mechanical Engineering: Director of Shopwork	1895-1907
August J. Hansen, B.S., Assistant Professor, Associate Professor, Foreman in Shopwork, Assistant in Library	1896-1938
Julian P. Griffin, Foreman of Iron Working Department	1897-1905
Edward Parley Pulley, B.S., Instructor, Assistant Professor of Machine Work and Forging	1900-1920
Edwin A. Williams, Foreman in Forging	1902-1906
Frederick Christion Wangsgard, Assistant in Forging	1903-1907
Frederick Arthur Dahle, Assistant in Forging	1903-1905
Frank Thatcher, Assistant in Carpentry	1903-1909
Aaron Newey, B.S., Assistant Instructor, Assistant Professor, Associate Professor in Forging, Associate Professor of Machine Work	1903-1944
Howard Peter Madsen, Assistant in Carpentry, Instructor	1904-1912
Jedediah H. Goff, Assistant in Forging	1905-1907
William A. Frew, Assistant in Forging	1907-1909
David Hughes, Instructor in Woodcarving, Assistant in Woodwork .	1909-1912
Heber J. Webb, Assistant in Forging, Farm Management, Extension Division	1909-1919
Wilbert S. Drew, M.E., A.M., Professor, Director, School of Mechanic Arts	1910-1913
William Thornley, Instructor of Horseshoeing	1911-1913
LeGrande Humphreys, B.S., Instructor, Assistant Professor, Associate Professor, Professor, State Supervisor, Charge of Teacher Training in Ag. and Shop Work, Agricultural Education	1912-1948
Dan A. Swenson, B.S., Assistant, Instructor, Assistant Professor, Associate Professor, Head, Carpentry and Woodwork	1913-1946
Asael Henry Fisher, Assistant in Forging	1915-1916
Alfred H. Powell, Instructor, Assistant Professor, Associate Professor of Farm Machinery	1917-1938
Louis Frank Winchell, Instructor in Auto and Tractor Work . . .	1919-1920
L. A. Shook, Instructor in Auto Mechanics	1919-1923
Sidney Stock, B.S., Instructor, Assistant Professor, Associate Professor of Radio and Automotive Electricity	1919-1947
Samuel Roy Egbert, B.S., Assistant Professor of Forging	1920-1945
C. H. Stephens, Instructor in Auto Mechanics	1921-1924
Fred Spencer, Instructor in Auto Mechanics	1921-1922
E. J. Yonk, Instructor in Auto Mechanics	1921-1923
Harry R. Reynolds, Graduate Chicago Art Institute, Instructor, Assistant Professor of Art and Photography	1924-1952

H. S. Carter, B.S., M.S., C.E., Professor of Civil Engineering 1936-1945
Clayton Clark, B.S., E.E., Associate Professor of Electrical Engineering 1937-1952
Frederick Preator, B.S., M.Ed., Professor of Tool Engineering, Hea, Tool Engineering Department 1937-1952
E. A. Call, Instructor in Auto Mechanics 1937-1939
Joseph Coulam, B.S., Professor of Woodwork and Building Construction, Head of Woodword and Building Construction Department, Entension Engineer 1937-1952
Larry S. Cole, B.S., M.S., E.E., Professor of Electrical Engineering, Head, Electrical Engineering Department . . 1939-1952
Arthur Charles Jacquot, B.S., M.S., Associate Professor of Agricultural Engineering 1940-1943
Ernest C. Jeppsen, B.S., M.S., Professor of Industrial Education, Chairman, Division of Technology 1940-1951
Vaughn Vance, B.S., Instructor in Radio and Aviation 1941-1942
Edward LeRoy France, B.S., Assistant Professor of Automotive Mechanics, Head, Automotive Mechanics 1942-1953
Edward W. Payne, B.S., Instructor in Radio and Aviation, Assistant Professor of Physics 1942-1948
Edwin A. Ross, A.B., Professor of Aeronautics 1942-1943
Bert V. Allen, Instructor in Photography, Photographic Service 1943-1952
William E. Mortimer, B.S., M.S., Professor of Industrial Education, Head, Industrial Education Department 1944-1952
Alexander Gilbert, M.E., Assistant Professor of Aeronautics . 1944-1946
Clyde Hurst, Instructor in Diesel Mechanics 1946-1952
Earl E. Holden, Instructor in Industrial Education 1946-1947
Anton B. Kemp, Instructor in Industrial Education, Head, Welding Department 1946-1952
J. Cecil Sharp, B.S., Assistant Professor of Air-Conditioning and Refrigeration, Head, Air Conditioning and Refrigeration Department 1946-1952
D. W. Mander, Instructor in Air Conditioning and Refrigeration 1947-1949
Louis Klein Jr., Instructor in Aeronautics 1947-1952
William L. Jones, B.S., M.S., Assistant Professor of Electrical Engineering 1947-1952
Charles N. Merkley, B.S., Associate Professor of Woodwork and Building Construction 1947-1952
C. D. McBride, B.S., M.S., Assistant Professor of Industrial Education, Director of Evening School 1947-1952
Ross A. Nyman, Instructor in Woodwork and Building Construction 1947-1952
Frank Olsen, Instructor in Forging 1947-1948
Karl W. Somers, B.S., Instructor, Assistant Professor in Tool Engineering 1947-1952
G. Merrill Shaw, B.S., M.S., Instructor, Assistant Professor, Associate Professor of Tool Engineering, Head, Engineering Drawing 1947-1952
Lowell P. Summers, B.S., Instructor, Assistant Professor of Aeronautics 1947-1952
Lynn R. Willey, B.S., Instructor in Auto Body Mechanics . . . 1947-1952

Donald J. Wadsworth, B.S., Instructor in Welding Department, Assistant Professor of Agricultural Engineering 1947-1952
Owen Slaugh, Instructor in Auto Mechanics 1947-1952
Hugh A. Buntine, B.E.E., Assistant Professor of Aeronautics, Head, Aeronautics Department 1948-1952
Angus Q. Woodruff, B.S., Instructor in Air Conditioning and Refrigeration 1948-1952
Vern R. Beecher, B.S., Instructor in Automotive Mechanics . . . 1949-1952
Charles W. Hailes, B.S., Instructor in Industrial Education . . 1949-1952
Lucy V. Heaton, B.S., Instructor in Photography 1949-1950
Dan H. Swenson, B.S., M.S., Instructor in Woodwork and Building Construction 1949-1952
Rawson D. Child, B.S., Instructor in Welding 1950-1952
*Fred R. Pryor, B.S., Instructor in Photography 1950-1952

*Catalogues 1890 to 1952. (Note: Entry of the names in the catalogue for a particular year does not always indicate accurately the date of service.)

VISITING PROFESSORS IN INDUSTRIAL EDUCATION*

E. L. Bedell

L. A. Blaser

W. M. Crawford

S. J. Pawelek

C. H. Ewing

E. E. Erickson

R. E. Fields

H. B. Gunderson

J. H. Lambert

C. K. Lush

R. D. Madsen

W. J. Micheels

Irvin S. Noall

A. R. Nichols

Amos E. Neyhart

V. H. Robertson

G. W. Seegmiller

J. H. Stephenson

H. E. Welch

*Date of service is omitted because such information is not available in most cases.

STUDENT INSTRUCTORS*

Karl Bentwet, Welding
Ronald G. Bowen, Radio
M. M. Bishop, Woodwork and Building Construction
Lynn J. Christensen, Welding
Edwin Carlson, Welding
John O. Canfield, Machine Shop
Urban S. Cheney, Woodwork and Building Construction
Howard R. Chapman, Electrical Engineering
Dwight R. Dixon, Electrical Engineering
B. M. Fitgerald, Machine Shop
Don B. Greenwood, Mechanical Drawing
Dale Gray, Mechanical Drawing
Merrill George Gessel, Air Conditioning and Refrigeration
Eugene Hardy, Auto Mechanics
Paul J. Kuhni, Machine Shop
Theodore Laser, Auto Mechanics
Dean H. Larsen, Welding
Austin G. Loveless, Mechanical Drawing
Wells P. McGregor, Welding
M. W. Metz, Industrial Arts
Richard E. Nelsen, Auto Mechanics
Joseph L. Oviatt, Mechanical Drawing
Erschel Shepherd, Welding
M. G. Tingey, Woodwork and Building Construction
V. A. Winward, Woodwork and Building Construction
Donald E. Wallis, Mechanical Drawing
Lyle R. Willey, Welding
Floyd S. White, Woodwork and Building Construction
C. C. Wright, Farm Mechanics

*Date of service is omitted because such information is not available in most cases.

MISCELLANEOUS*

M. H. Dover, Instructor, Electrical Engineering (Navy Radio)

J. V. Davis, Instructor in Aeronautics

G. W. Galloway, Part-time Instructor in Welding

Dean H. Hale, Instructor in Air Conditioning and Refrigeration

Leslie Hollis, Instructor in Aeronautics

Victor Larsen, Part-time Instructor in Forging

Walter A. Lacey, Instructor in Aeronautics and short time Head

John L. Peterson, Instructor in Aircraft and Radio

Donald Shoup, Part-time Instructor in Auto Body Mechanics

L. G. Wines, Professor in Aeronautics and Head for one year

Paul F. Woolrich, Instructor in Engineering

*This group of instructors was not under contract long enough to be listed in the catalog, or did not merit a full-time contract.