History of the State University of Iowa: the College of Engineering

Norbert Clement Barrett

University of Iowa

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HISTORY OF THE STATE UNIVERSITY OF IOWA:
THE COLLEGE OF ENGINEERING

by

Norbert C. Barrett

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, in the Department of History, in the Graduate College of the State University of Iowa

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An architect engineer should be ingenious, and apt in the acquisition of knowledge. ... He should be a good writer, a skilful draftsman, versed in geometry and optics, expert at figures, acquainted with history, informed on the principles of natural and moral philosophy, somewhat of a musician, not ignorant of the sciences both of law and physic, nor of motions, laws, and relations to each other, of the heavenly bodies. By means of the first named requirement, he is to commit to writing his observations and experience, in order to assist his memory. Drawing is employed in representing the forms of his designs. Geometry affords much aid to the architect; to it he owes the use of the right line and circle, the level and the square; ... The science of optics enables him to introduce with judgment the requisite quantity of light, according to the aspect. Arithmetic estimates the cost, and aids in the measurement of the works; this, assisted by the laws of geometry determines those obstruse questions, wherein the different proportions of some parts to others are involved. Unless acquainted with history, he will be unable to account for the use of many ornaments which he may have occasion to introduce. ... Music assists him in the use of harmonic and mathematical proportions. ... Moral philosophy will teach the architect engineer to be above meanness in his dealings, and to avoid arrogance; it will make him just, compliant and faithful to his employer; and what is of the highest importance, it will prevent avarice gaining an ascendancy over him; for he should not be occupied with the thoughts of filling his coffers, nor with the desire of grasping everything in the shape of gain, but, by the gravity of his manners, and a good character, should be careful to preserve his dignity.

INTRODUCTION

Engineering as understood in its earlier uses referred to the operations of those who constructed engines of war and executed work intended to serve military purposes. In the second half of the eighteenth century, however, there arose a class of engineers who were neither military men nor concerned with the execution of works exclusively military in purpose. To this class of men, by way of distinction was given the name of Civil Engineers. Although this field soon became complicated with the development and production of mechanisms and machinery, electrical and chemical phenomena and mining, no distinction between the specialized fields was made until the American Society of Mechanical Engineers was founded in 1880.

Defined in their charter under date of 1828, the London Institution of Civil Engineers describe the aims and functions of the civil engineers to be the

Art of directing the great sources of power in nature for the use and convenience of man, as the means of production and of traffic in states, both for external and internal trade, as applied in the construction of roads, bridges, aqueducts, canals, river navigation and docks for internal intercourse and exchange, and in the construction of ports, harbours, moleys, breakwaters and light houses and in the art of navigation by artificial power for the purposes of commerce and in the construction and adaptation of machinery, and in the drainage of cities and towns.

Wide as was the enumeration, the practice of the civil engineer during the first quarter of the nineteenth
century frequently covered many or most of the subjects. With the development of science and the growing complexity of machinery, however, the need and urgency for specific preparation and education was very soon emphasized. Although professional education generally made substantial advances during the first half of the century, the great advance was witnessed in scientific and technical training.

Defined as the "special training of persons in the arts and sciences that underlie the practice of some trade or profession," the first technical instruction in the United States appears to have been given in connection with the United States Military Academy organized in 1802, at West Point. Although the instruction was concerned primarily with military problems many who graduated entered general business and played an important role in the development of the railroad system. The earliest effort to meet the crying need for engineering, other than military, and technical schools, so rapidly developing industry and transportation was the Rensselaer Polytechnic Institute, founded by the eighth patroon at Troy, New York, in 1824. From the beginning the Institute had a very comprehensive course of practical science, with equipment that included the first laboratories designed for students' use in the United States. The first class in civil engi-
engineers began to take an increasing interest in education and, after 1870, a literature of engineering began to develop through the authorship of leading professors and technical men that gave to the profession elements of solidarity and influenced the scheme of engineering education both in regard to subject matter and method of instruction. Under the impetus of the Morrill Land Grand Act, passed by Congress in 1862, and specifically prescribing that the Land Grant Colleges teach "such branches of learning as are related to agriculture and mechanic arts," and the economic pressure so intensified by the needs of the nation in the years that followed Appomattox, institutions for engineering education grew apace, and in 1937, numbered
one hundred and fifty five degree granting colleges with a total enrollment of over seventy five thousand students.
Chapter I
EARLIEST ENGINEERING EDUCATION AT THE
UNIVERSITY OF IOWA 1857-1873

The stimulus which was given to the establishment of technical schools during the nineteenth century by the development of science and its application to machinery was not long absent from the State University of Iowa. Although not located in the center of industrial development, the need of technical courses to provide education for greater and more efficient production was realized by many Iowans as well as the pioneer educators of the University. Giving consideration to the practical bearing of study upon various occupations or the relationship of acquired knowledge and the business of life in this country, particularly the West, both recognized the demand for mathematics, — pure and applied. They observed, further, that in an era of rapid geographical expansion and growing population the solution of material problems must necessarily occupy a considerable part of the college graduate's life. Confronted with such changing attitudes and accompanying problems the immediate need for an enriched and liberalized curriculum giving proper place to the new fields and methods of study was recognized by most university faculty members by 1857, when they prepared and sent to the legislature a remarkable memorial calling attention, among other things,
to the heavy and increasing capital invested in the railways, which are already seeking various routes across the continent, and yet the West has no school for educating civil engineers and preparing them to give a judicious direction to all this moneyed capital. 1

The absence of practicability in higher education noted by some members of the faculty and the suggestion that either some provision for engineering education be made or engineering as a special course be established at the University brought no active support from the legislature. The incident indicated, however, that the faculty was cognizant of the people's eagerness for practical education and of the disinclination of some students to remain in college until a classical or philosophical course was completed. Already it was evident that people were hastening to acquire wealth from a country offering unlimited material opportunities. New methods of land cultivation, together with more rapid means of transportation and communication were introduced and children were crowded into schools that taught the branches demanded for every day life, - reading, writing, ciphering, and geography. Because Latin brought no dollars and Greek was not quoted in the market, these subjects were considered to pay small dividends and to be of little practical value or necessity in the acquisition of wealth. 2 Moved by utilitarianism people in Iowa considered
the discovery and effective development of their resources
to be most important in the economic growth of the State,
and they looked to the State University for effectively
trained engineers to advance progress.

In the absence of legislative action providing
for an Engineering Department to assist in meeting both
the current and future need for engineers the Department
of Mathematics at the University of Iowa, insofar as staff
and equipment would permit, expanded it's offerings to in­
clude several courses in engineering. A complete set of
surveying and engineering instruments which combined the
most recent improvements with a substantial style of work­
manship was acquired\(^3\) and an announcement was made in the
University Catalogue, for 1857 that students of Surveying
and Civil Engineering would be "thoroughly drilled in the
use of instruments by frequent field exercises and by
exercises in draughting."\(^4\) The "design," according to the
same announcement, was "to teach land surveying in addi­
tion to book surveying." It was declared that "A practical
knowledge of these branches must be acquired in the field
not in the recitation room."\(^5\)

These meager beginnings of engineering instruc­
tion in 1857 by the Mathematics Department were expanded,
under the direction of Professor Nathan Leonard, to such
extent that before the close of the sixth decade instruc­
tion was given,
in theory and practice of Civil Engineering; the object of which was to qualify the students for useful positions in the profession. The instruction contemplated an acquaintance with topographical drawing, a familiarity with the theory of engineering instruments and their repeated use in the field. Through comprehensive thought and planning the course of study in Professor Leonard's department was made to include such engineering subjects as Topographical Surveying, Strength of Materials, Construction of Bridges and Arches as well as Designs and Drawings of Structures. These efforts put forth by the Mathematics Department to meet the clamorous demands for engineering instruction in the absence of a special department attracted the attention of a committee from the legislature visiting the University in February 1870. Following the visit and study of the committee, a recommendation was made that a "Chair of Civil Engineering" be established, but like the faculty memorial of 1857 it fell on deaf ears and no official action was taken. The failure to act, in accordance with the committee's recommendation was caused not so much from a lack of concern for engineering problems or because of failure to appreciate the need for well-trained engineers as from the inherent conservative attitude of many regarding the function of the University, and the fact that the major portion of educational interest was absorbed by the recently-established departments of Medicine and Law. That the Board of Regents
recognized, in some measure, the need for engineering education and desired to have it continued, within certain limitations, was indicated by the favorable consideration given to Professor Leonard's request for an assistant. Appointed Assistant Professor of Mathematics, on July 29, 1871, by the Executive Committee, Alexander Thompson, C. E., was given charge of Civil Engineering and Drawing. His stay at the University was brief, ending on March 10, 1873, when he accepted the Chair of Mechanical and Mining Engineering, at Iowa State Agricultural College. In this period, however, he did much to advance and popularize engineering. Enthusiastic and systematic in his work, he increased the efficiency of instruction and prepared the way for the establishment of an "Engineering Chair." It was during this period that a valuable collection of models for illustration in Bridge Building, Railroad Engineering, Hydraulics and Drawing was transferred from the United States Patent Office to the University. At the same time a complete set of United States Lake Survey charts showing the topography of the lakes was obtained for use in topographical surveying and drawing classes. Professor Thompson deserves credit for the construction of a bridge model, eighteen feet in length, which exhibited in a new and simplified manner the strain on the different parts of such a structure.
Although the instruction in civil engineering was developed within the Mathematics Department in a creditable fashion it did not satisfy the demand for engineers, and by the early seventies, the creation of a "Chair of Engineering" had become imperative. Continued delay during these years was undoubtedly due to the appointment of George Thacher and his subsequent actions as President of the University.

Educated in the Yale Divinity School President Thacher was ordained in the Congregational Church in 1844. After having various charges in New England he came to Iowa in 1860 and was serving as pastor of the Congregational Church in Waterloo at the time he was invited to become President of the University. Competent as a teacher he had no special training or experience in administrative work. His highly sensitive nature and inclination to be dictatorial in his attitudes served to make him incapable of working harmoniously with such strongly individualistic men as made up the University faculty at this time. As Professor Leonard asserted he was, "a square peg in a round hole." The philosophy of education expressed in his Inaugural Address, delivered at the University Commencement in 1871, was not characteristic of the attitude toward higher education then generally accepted. With many theological abstractions he undertook to describe the nature of culture and the method of ac-
quiring it in a university education. "Culture," he as-
serted, "is intellectual discipline and enlightenment.

Each of these elements," he declared,
is both a process and a result, the result
being as gradual as the process, and travelling
along with it at equal pace from the beginning
for an indefinite period. Of these two ele-
ments of culture, discipline is the improve-
ment of the mental powers by exercise and drill;
enlightenment is their improvement by the appro-
priations of that various knowledge before
spoken of, reduced to order in the mind and made
its permanent possession.

The value of discipline consists, chiefly in
these two things: first, that it increases the
working power of the intellect; and secondly,
that it subjects it, thus improved, to the
command of the will. The value of enlighten-
ment consists, chiefly, in these two things:
that it increases the material on which the
intellect works, that is its knowledge; and
secondly that it renders this material service-
able for all the purposes of the soul. The two
are, therefore, inseparable and cooperative, and
both of them combine to make a truly cultivated
mind.

True culture, then, is that high intellectual
condition in which a man has the free use of his
powers of thought, together with a great amount
and variety of well digested knowledge. He
stands on an eminence, and his vision sweeps over
broad fields of truth.20

After asserting that the University should deal with that
from which culture was achieved the new President pro-
ceeded to explain the manner in which this could be done:

But exactly what is to be the academical course?
Chiefly study, - of the ancient classics of the
modern languages, of mathematics, of natural,
physical and political science; of philosophy
and English literature; each to be adjusted to
the others in such proportions that the effect of the whole curriculum shall be as nearly as possible, not a one-sided but a symmetrical and well balanced education. This general plan of instruction is the result of profoundest thought and the ripest experience and wisdom of our most accomplished and successful educators. And it is not likely that in this country, for generations to come, that it will suffer more than an occasional infraction or dismemberment. And the time is fast coming when the recent loud outcry against the required study of Latin and Greek in our Colleges will seem too absurd and even ludicrous ever to have been sincere; for it is one of the surest means of elegant and finished culture. The languages themselves are more nearly perfect than any other ever used by men .... The ability to read them is the key to treasures of knowledge.... Moreover, while the principle of elective studies is undoubtedly wise, if not applied too extensively, it is one of the most valuable characteristics of our higher institutions that they require conformity to a prescribed course of study. For there can be nothing more unquestionable than that the youth who repair to these institutions are incapable of wisely judging what branches of learning they ought to pursue. It is one of the chief functions of such an institution to provide a carefully elaborated plan of study, adopted in its several parts and combinations to the average capacities and needs of the different classes. And it is one of the highest advantages of students that such a course is laid down for their guidance by men of experience and wisdom, and one that will, if diligently pursued, raise themselves to the rank of scholars and start them out on a career of life long intellectual improvement. 21

The fact that President Thacher did not sense the trend of education; that he did not appear cognizant of a deficiency in the University organization, or evidence concern for the need of a special course in engineering, did not deter Professor Leonard from expressing his opinion or continuing his effort to provide maximum engineering instruction
in the Department of Mathematics. Reporting to the President, in 1871, he expressed the need for engineering education and stated that the Mathematics Department was organized to prepare students who were desirous of entering various branches of engineering.

Our system of public works is doubtless still in its infancy and destined to be indefinitely enlarged. Our railroads, lands, bridges, and tunnels, upon which, and through which the commerce of the future is to be born are just beginning to spring into existence. The immense deposits of coal and mineral which now lie concealed beneath our soil or locked in the embrace of our mountain ranges are to be sought out and opened up for use. The solution of every one of these problems requires a more or less profound knowledge of mathematics, and altogether they are calling for an army of engineers and architects. It is certainly the part of wisdom to furnish such facilities for the training of these, that whatever structures they may rear shall be of such proportions, and of such materials as shall withstand to the last possible limit the strain which time or pressure may bring to bear upon them.

Professor Leonard reported that in order to assist in meeting the demand for engineers and to provide courses essentially belonging to an engineering course of study,

The Mathematical Course of the University has been arranged in two sections. The first embraces such a proportion and such a selection of mathematics as is believed to be necessary for the purpose of general culture and is made obligatory upon students who would compete for any academic degree.

The studies of this section extend over three years and are not materially different from the required mathematics of the average of our best American Colleges except that a greater prominence than usual is given to geometrical drawing.
The second section, succeeding the first in the order of time, embrace the mathematics necessary for entering the practice of the different branches of engineering.

The studies of this section are optional. Those who seek a literary or general culture may omit these. But on the other hand those who would follow the profession of engineering are afforded an opportunity of acquainting themselves with those mathematical laws and processes which are the only safe reliance in the prosecution of their chosen avocation. The greatest need of the department at the present is:

1. A collection of models illustrating the different styles of structures, as of bridges, arches, etc.

2. A full collection of the various instruments used by engineers so that the pupils may be made practically acquainted with their constructions, adjustments, and use.

3. A set of drawings of some of the most important public works, exhibiting the manner of their structure, their strong and their weak points, and showing how the latter are guarded.

4. A set of models for the study of the higher mathematics.

This report though it did not move President Thacher to act for the establishment of a special course or chair of engineering was staunchly endorsed in a speech, delivered by Representative J. W. Green in the Iowa General Assembly, 1872. Herein, the speaker expressed his opinion on the function of a University in a searching, logical and excellent manner. Though less literary and perhaps less sensitive to cultural values and the beauty of a cultivated mind than President Thacher, Representative Green was a man
of worldly experience and he "elicited a hearty round of applause from the floor and galleries," as he expressed quite accurately the general conception of the University and the most cultivated sentiment of the commonwealth.

Why should not we possessing every advantage of soil, of mineral privilege, learn as Everett says, "That intellectual centres with their universities and foundation schools are the regions to which commerce finds its way - not merely adding to the material wealth of the community, but quickening the energy of industrious classes, and furnishing the sinews of war to the champions of popular liberty." ... We are a young prosperous state trusting and reliant in our own resources. ... We have a University dependent upon the state for the means to produce the result demanded by the educational interests of the State. ... it has been subjected to criticism by those who desire to limit it to a mere scholastic or literary training. ... to disincorporate any particular science is an impediment to advancement. A direct demand is made upon the institution for facilities that will enable it to compete with sister institutions in other States. Be they ever so skillful, the teachers must have charts, specimens, and other facilities that will enable them to impart a complete practical education.

The scope of the University's functions, continued Representative Green, should be such as to make it no mere school for common attainments, but one the course of whose studies, the breadth of whose and the advantages of whose varied departments, shall tend to elevate and enable the social characteristics of the State.

One not distinguished for men in classical or literary attainments alone, but one adapted to the wants and business of society, and based upon the practical, when the rising generations can find the inducements that can hereafter be developed into the useful by a
skillful application of the financial agricultural and moral interests of the nation.

An institution that shall culture men who will go out into the world's fields and forum and be found pleading for the interests of humanity there. 26

Awakened to the nature of the broader function of a University the Board of Regents recognized the need for a revision in the course of study and an enrichment of the curriculum. At the meeting held on June 22, 1872, a committee, composed of President Thacher and Regents McKeen and Adams, was instructed to examine the course of study and report the revision considered desirable. 27

That the committee members were greatly influenced by the conservative President Thacher in the work of revising the course of study is clearly evidenced in the report of their single conference which was held in Dubuque on December 27, 1872. Reporting the results of the committee's deliberations, President Thacher, in addition to restating certain principles enunciated in his inaugural address, asserted that he had called upon each member of the faculty in the Academical Department to prepare a paper setting forth in general and in as much detail as he might desire, his independent views on the subject of the wisest plan of study not in their respective chairs alone, but the whole Department. 28

Eager to cooperate in any action for the best interests of the University each professor complied with the request of President Thacher, and the various faculty papers when
spread before the committee "proved to be of the greatest service to them in their consultation."

The results of the committee's deliberations as reported to the Board of Regents in March, 1873, by the secretary of the committee, were summarized by President Thacher.

1. In view of recent modifications of public sentiment in regard to higher education, and of the present and prospective demand for such education in our rapidly growing commonwealth, of the wide range of talent, taste, and plans for life of those who resort to our Academical Department for the purpose of study and instruction;—it is evidently of the highest importance that the institution be furnished with the most abundant and various facilities for both general and special culture which the resources at command of the Regents will allow. Your committee therefore are fully of the opinion that there should be, in place of the mixed course, three distinct courses of study extending, each, through the usual college curriculum of four years. Of these the First should correspond as would be practicable and wise in the circumstances of a Western State University, to those ideas and principles which for the most part give shape and character to the collegiate courses of study throughout the country. Necessarily this involves the imperative study of both Greek and Latin, the former of which has never been required of our students, but which as well as the latter, is, with one or two exceptions an unvarying prerequisite to the degree of Bachelor of Arts, the historic academic honor with which it is proposed to crown those graduates who shall complete this course.

But among the members of our Academical Department there will doubtless always be many for whom the Ancient Language of Greece
will have no attraction and who will be wholly unwilling to make the study of it a part of their education. In view of this fact it is deemed best by your committee that there should be a second course equal to the First in its demands on the time and talents of the student, and in the amount of knowledge and the degree of discipline which the successful prosecution of it must secure. Besides the exclusion of Greek from this course, there should be required less study of Latin than in the First, more of Modern Languages and more Mental Sciences, while in respect to Natural and Physical Science, Chemistry and Mathematics the two courses should be equal. This curriculum should terminate in the Degree of Bachelor of Philosophy.

The Third course demanded by the general considerations before given us is one in which the ancient classics would have no place, and the study of Mathematics and Science should predominate, the graduates to receive the degree of Bachelor of Science. The Committee referred the further consideration of the 3rd. course to the President and Scientific Professors.

Besides the three full courses now described and in immediate connection with the Third it seems to the Committee highly desirable that there should be special courses in Civil Engineering and Practical Chemistry, and others according as circumstances shall demand with equitable Degrees.

Such was the 1st and chief results of the deliberations of the Committee.

2. It was agreed that there should be very few electives in each course, the principle of election to be limited to a choice, at the beginning between the courses.

3. There should be no crossing from one course to another, but the selection made at the commencement of the Freshman Year should be understood as binding the student for four years.

4. There should be but three recitations per day through the entire curriculum.
5. The study of Physics and Chemistry should be transferred from the Sub. and Freshman Years, and continued only three terms, or at the longest but four, i. e. to the end of the 2d or 3rd term of Junior year.

6. Mental Science should be required in each course, one term each, in the first and third, two terms in the second and an elective term additional in the first.

7. The study of both Ancient and Modern language should be excluded from Senior years.

8. The programme for the entire Department should be so made that the students in the several courses who pursue the same study, can do so in the same class (or under the same teacher, in the same place and at the same hour.)

9. The prescribed preparation for entering freshman year should be the same for each of the three courses.

These conclusions of the committee were referred to the University faculty for consideration before submission to the Board of Regents for final action. At the suggestion of the faculty the preparation of the several courses of study was assigned to faculty committees which were instructed to report the results of their efforts at future meetings of the faculty. The courses of study as reported at the faculty meetings were freely discussed and with minor revision formally adopted. It was voted by the faculty that the courses be known as, Classical, Philosophical, Scientific and Civil Engineering and that the degree Bachelor of Arts be given to graduates of the Classical Course, the degree of Bachelor of Philosophy to
those completing either the Philosophical or Scientific Courses and that of Civil Engineering to the graduates of the Civil Engineering Course. For civil engineering the committee on the scientific course reported a course of study which was accepted by the faculty on February 21, 1873, and by the Board of Regents on March 4, of the same year. Civil Engineering was thus officially provided for, and it was announced in the University Catalogue for the year 1872-73 that:

1. The Course in Civil Engineering, now first established occupies four years.

2. The terms of admission are the same as those prescribed for the other courses on page 32.

3. The instruction in this course will be given throughout by the Academical Professors and their Assistants.

4. The studies of the first two years are identical with those of Freshman and Sophomore years of the Scientific Course.

5. The following is the plan of study for Junior and Senior Years:

<table>
<thead>
<tr>
<th>JUNIOR YEAR</th>
<th>SENIOR YEAR</th>
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</thead>
<tbody>
<tr>
<td><strong>Fall Term</strong></td>
<td><strong>Fall Term</strong></td>
</tr>
<tr>
<td>Differential Calculus</td>
<td>Geology</td>
</tr>
<tr>
<td>Physiology</td>
<td>Geology: Field</td>
</tr>
<tr>
<td>Perspective Drawing</td>
<td>Practice, adjustment and use of instruments</td>
</tr>
</tbody>
</table>

<p>|  | <strong>Winter Term</strong> |
|  | <strong>Winter Term</strong> |
| Zoology | Geology |
| Integral Calculus | Astronomy-Theoretical |</p>
<table>
<thead>
<tr>
<th>Winter Term (Cont'd)</th>
<th>Winter Term (Cont'd)</th>
</tr>
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<tbody>
<tr>
<td>Machine Drawing</td>
<td>Bridge Building and Stability of Structures</td>
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<tr>
<td></td>
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<tr>
<td>Spring Term</td>
<td>Spring Term</td>
</tr>
<tr>
<td>Zoology</td>
<td>Astronomy - Practical Engineering</td>
</tr>
<tr>
<td>Mechanics</td>
<td>Road Surveying</td>
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<tr>
<td>Strength of Materials</td>
<td></td>
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<tr>
<td>Building Materials</td>
<td></td>
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</tbody>
</table>

6. The Degree of Civil Engineering will be conferred on those who complete the course.

7. Those who prefer it will be permitted to take a selection of such studies as are strictly in the line of Civil Engineering, and on leaving the institutions will receive a certificate of proficiency, signed by their Instructors and the President.

8. Students pursuing this course will have the advantage of a costly collection of standard works of reference; of a good supply of instruments; of valuable charts published by the United States Lake and Coast Survey; of about three thousand models from the Patent Office, illustrating almost every branch of Engineering; besides a very fine bridge model, eighteen feet in length, exhibiting in a new and simple manner the strain on the different parts of such a structure, made for the University by Professor Alexander Thomson, now of the State Agricultural College.

It is the purpose of those in charge of this course to make it as thorough and as practical as possible.

The Course of Civil Engineering officially adopted in March was given actual authority on June 19, 1873, when the Board of Regents voted unanimously that the "Chair of Engineering be established," at the State University of Iowa.

STATE UNIVERSITY of IOWA
Chapter II
PROBLEMS OF ORGANIZATION 1873-1887

To fill the position of professor of civil engineering created by the establishment of that "Chair" in 1873, the Board of Regents selected Philetus H. Philbrick, M. S., C. E.¹

Educated at the State University of Michigan, Professor Philbrick was graduated, in 1868, receiving the degree of Civil Engineering. Almost at once, following graduation, he started to practice his chosen profession in Michigan where for the next five years he was employed in laying out portions of the Grand Trunk Railway in that state.² Progressive and independent in thought, fearless in expression, well grounded in both pure and applied mathematics, and possessing the practical experience of a field engineer³ he was eminently qualified to assume his new duties which were designed to prepare students for the same average usefulness in the affairs of life as other graduates and in addition thereto to enable them, as inclinations direct and opportunities offer, to take an active part in the material progress of the times.⁴

With an objective sufficiently comprehensive and worthy of a long established and well organized department, Professor Philbrick began his work of instruction and organization. Occupying two small rooms on the second
floor of South Hall and a room in the Armory building he offered a four years' course in civil engineering. The first two years were identical with the scientific course while the two later years were given to professional work and training. The following essentially engineering courses were offered:

**Fall Term**

- Mechanics.
- Shades, Shadows and Perspective.
- Geometrical Drawing.
- Descriptive Geometry.

**Winter Term**

- Mechanics.
- Machine Drawing.
- Geometrical Drawing.

**Spring Term**

- Strength of Materials.
- Land Surveying.
- Higher Surveying.

Equipment on hand for aids in instruction or demonstrative purposes was very limited and consisted in the main,

of the charts published by the U. S. Lake and Coast Survey; of maps and drawings of R. R. Surveys and works; of about three thousand models from the Patent Office illustrating almost every branch of engineering; of numerous drawings of photographic views of machinery; besides a very fine Bridge model exhibiting in an elegant manner the strain upon the different parts of the structure.

With a small number of students enrolled and inadequate
facilities, the chair of engineering as created in the Collegiate Department began a process of development which was to continue even after a top ranking position in the university's family of professional colleges had been attained. The optimistic hope of Professor Philbrick and the promise of civil engineering, however, to become in magnitude and efficiency all that the importance of the profession might justly expect was realized only after difficulties and almost insurmountable obstacles were overcome. From the beginning, both the President of the University and many members of the academical faculty not only opposed engineering by an adherence to the conservative educational philosophy regarding the function of a university but they ingeniously sought to prevent the progressive development of an independent engineering department. In addition to classifying all collegiate courses into one of the three groups — classical, philosophical or scientific — they catalogued engineering students as "collegiate" and declared that effort would be made to make the course in civil engineering as comprehensive as the means at hand will allow, and sufficiently flexible also to meet the demands of most students seeking a liberal rather than a special education.

Professor Philbrick, however, entertained a clear idea concerning the status of the "Chair" to which he had been elected. From the beginning he presumed it to be
independent and separate from the academical department. By its unique place in the curriculum, the growing importance of the engineering profession, and the trend of leading schools, colleges, and universities to educate for technical or professional purposes, he was convinced that "if there be a Department of any Science in any Technical School, College or University it should be one in Civil Engineering." On this conviction, and in accordance with it as a principle, much to the chagrin of the academical faculty, he proceeded to act. Without faculty consultation or advice he classified students in civil engineering, effected a revision of the original engineering course of study and, in 1876, recommended the first candidates for the degree of Civil Engineering.

The new course, which after presidential recommendation was adopted by the Board of Regents, on June 27, 1874, included studies designed to occupy five years. One year was devoted to the sub-freshman or preparatory branches, and four years to those on collegiate level. Although elective subjects, properly so called, were not contained in the course, due credit was given for proficiency in certain studies not included in the program but deemed to be advantageous to the students and consistent with the principal object in view. Students entering the sub-freshman class, in addition to fulfilling requirements named for other academical courses,
were required to be at least fifteen years of age, while those entering a later class were required to be propor-
tionately older. The course of study for engineer-
ing students adopted at this time was as follows:

Sub-Freshman Year.

Fall Term.

University Algebra.
English Etymology and Syntax, - Brown.
Elementary Drawing, Instrumental and Free-hand Tinting, Shading and Blending. Graining, Lettering and Ornamentation.
Plans and Sections of Buildings.
Use of instruments and materials.

Winter Term.

University Algebra finished.
Composition and Rhetoric, - Hart.
German Grammar, - Comfort.

Spring Term.

Geometry, (two books), - Robinson.
German Reader, - Adler.
Roman History, - Smith.

Freshman Year.

Fall Term.

Plane Geometry, - Robinson.
German.
French.

Winter Term.

Solid Geometry and Plane Trigonometry, - Robinson.
French.
Geometrical Drawing - Elementary Projections.
Details of Construction and Execution of Problems in Masonry, Wood and Metal.
Winter Term (Cont'd)

Isometrical Projections and Drawings.
Oblique or Military Projections.
Exercises in shades and shadows.
Elementary Structural Drawing.
Wing Walls, Retaining Walls and Fortifications;
Piers, Abutments and Columns; Culverts,
Bridges and Foundations.

Spring Term

Spherical Trigonometry, - Robinson.
Land Surveying, - Gillespie.
French.
Exercises in English Composition and Declamation throughout the Year.

Sophomore Class.

Fall Term.

Descriptive Geometry.
Analytical Geometry of two dimensions.
Physics.
French or German.

Winter Term.

Analytical Geometry of three dimensions.
Chemistry.
French or German.

Spring Term.

History.
Chemistry.
French or German.

Junior Class

Fall Term.

Differential Calculus.
Theory of Shades, Shadows and Perspective.
Drawing.
General Course, including lectures on Mechanical Work, on Impact, and on the movement of bodies in space under the influence of variable forces.

Winter Term.

Integral Calculus.
Mechanics; Fluids, including the Principles of Hydrostatic and Hydraulic Instruments, Water Wheels and Machines for Raising Water — Wind Mills, Pumps, Hydraulic Rams, etc.; Lectures on the Impact of Fluids Upon Solids or Fluids, at rest or in motion.

Machine Drawing; Principles of Machinery, or Pure Mechanism, including Gearing, Cams, and various combinations, with the solution of original Problems. — Willis' Principles of Mechanism.

Spring Term.

Strength and Resistance of Materials.
Mathematical Theory of Light, with Application to Instruments.
Physics and Chemistry.

Senior Class.

Fall Term.

Higher Surveying; Gillespie's Leveling, Topography and Higher Surveying; Henoke Field Book for Railroad Engineers; Gillespie on Roads and Railroads.


Winter Term


Geology.
Spring Term

Astronomy - Practical.
Theory of Suspension Bridges and Arches; Curries of Equilibrium;
Retaining Walls; Dams and Reservoirs; Tunnels and Foundations.
Morain's Traite d' Hydraulique and
Weisbach on the Flow of Water through Pipes and Channels.
Drainage, Sewerage and Water Supply for
Towns and Cities.
River and Harbor Improvements.
Laboratory Work and Geology.

The new course of study was revolutionary to
the conservative educational philosophy of the academical faculty in so far as it offered greater freedom and advan-
tage in the field of engineering. Of necessity, how-
ever, it required civil engineering students to prosecute a large part of their five years' course under the academical instructors. This requirement together with the regulation that they be subject to the same rules of government and order, as those enrolled in the academical department so closely allied the two departments that dissatisfaction soon resulted. It was an anomalous condition. Not inclined to regard engineering as a chair in the collegiate department, which was designed for general culture; it did not seem quite easy for the president or faculty to regard it as a department separate from the academical. "The connection between the two departments was not desired," wrote President Thatcher, yet his sub-
sequent actions seem to indicate that he did not consider
it desirable to have civil engineering independent. In an effort to emerge from his dilemma he endeavored to effect and maintain a semi-independent status for civil engineering. By regulations submitted to the Board of Regents and adopted by them, on March 4, 1875, it was declared that:

1. The professor of Civil Engineering shall be regarded as a member of the Academic Faculty in all matters of government and order.

2. All questions pertaining to the studies and classification of the students of Civil Engineering shall be referred to the President and the professor in charge.

3. Said students shall be subject to the same rules of order as those in the Academic Department.

Comprehensive and definite as these rules were thought to be, at least by their author, they did not determine the status or rank of civil engineering in the University organization. Was it a department coordinate with that of Law and Medicine or was it a course of study in the academical department? To the academical faculty the theoretical status of the engineering chair was incongruous with its actual functioning and administration. This incongruity made for definite dissatisfaction, the apogee of which was reached and voiced in 1876. At this time three students having been recommended for the degree of Civil Engineering, the Board of Regents, in the absence of precedent, yet in keeping with the regulation
which stated that civil engineering students “on leaving the institution will receive a certificate of proficiency, signed by their Instructors and the President,” directed “the academical faculty to sign the diplomas of those receiving the degree of Civil Engineering.” Almost immediately upon learning that the Board of Regents had passed a resolution directing them to sign the diplomas of students they had not recommended, the faculty assembled in Professor Currier’s room to discuss the situation. The meeting was attended by Professors Leonard, Hinrichs, Fellows, Parker, Calvin, Pinkham and Currier. After considerable discussion the group unanimously adopted a memorial which was promptly communicated to the Board of Regents. Herein the attention of the Regents was called:

1. to their own actions in relation to the Civil Engineering chair or Department.

2. To the Report of the President to the Legislature.

3. To the last Catalogue pages 9 and 21 declaring that there are four departments and four faculties and that the Civil Engineering Course is in charge of a single Professor.

4. The confusion indicated in the forthcoming programme to the administration of the department or chair during the past.

(1) The Civil Engineering students were not subject to Military Drill because they were not members of the Academical Department.
(2) The course of study for (Civil Engineering) was prepared exclusively by the Professor of Civil Engineering and the President.

(3) The classification in course of students in Civil Engineering is done by the Professor alone.

(4) The Professor recommends those who have completed the course for graduation and is expected to call their names and introduce them to the President on Commencement Day. 28

Unwilling to assume the measure of responsibility which they believed the signing of diplomas to entail, the faculty indicated that they considered it to be just as improper for them "to sign the Diplomas of those receiving the degree of Civil Engineering as to sign those of the Law or Medical Departments."

Obviously, a crisis had been reached, and the time was at hand when a definite statement in regard to the status of civil engineering was necessary. The faculty, therefore, in closing the memorial asked the Board of Regents in a direct and pointed fashion: "1. Is Civil Engineering a Department coordinate with the Law or Medical; or a course of study in the Academical Department? 2. If it is a Department has it a Faculty? 3. Who compose its Faculty?" In a reply made without delay to the faculty questions, the Regents declared:

Whereas a misunderstanding has arisen in relation to the position occupied by the course of study in Civil Engineering and as to the proper persons to sign the diplomas for graduation. Therefore:
Resolved, that Civil Engineering be considered a department in the University and that the faculty be declared to consist of the President of the University, who shall be President of that faculty, of the Professor filling the Chair of Civil Engineering and such other professors as assist in instruction in that Course of Study; and that the members of such faculty sign the diplomas of graduates in this department.

The adoption of the resolution which gave departmental rank to civil engineering was undoubtedly a progressive move on the part of the Board of Regents, for it was manifest that real progress in engineering education could never be achieved unless the restraints of the academical faculty were removed. Equally manifest at this time was the fact that progress in the department could not be accomplished without an appropriation for engineering equipment. The Board of Regents, however, did not make the necessary appropriation. Already the dire consequences of a period during which prosperity had been too rapid and expenditures too lavish were beginning to appear and very shortly the period of severe retrenchment and depression was upon the nation.

This economic depression was a contributory cause for the "lack of instruments" and the "notable deficiency of books" for engineering instruction at the time the department was created. More specifically, however, was the economy measure adopted by the Board of Regents, on March 4, 1874, and the apathy of President Thatcher in comprehending the importance of a well equipped department of engineering. Directed at this time by the "Economy Resolution" to
observe strict economy in matters pertaining to the
library appropriation and to require that all expendi-
tures be discontinued, unless after consultation with
the professor for whose chair it had been made, it was
considered indispensable. President Thacher made no
effort to secure even a small appropriation for the
chair of engineering. On the contrary, although cognizant
of the fact that no appropriation had been made for civil
engineering since the creation of that chair, and with
full knowledge that a shortage of apparatus, materials and
furniture existed, the President summarily reminded
Professor Philbrick of the "many and urgent demands for
money", and requested that he refrain from making any de-
mands for equipment or "engineering wants" in his annual
report. Knowing the President's conservative attitude
Professor Philbrick acceded to his request anticipating that
perhaps a year hence a generous appropriation might be
procured. The extent of engineering instruction given
and the great need for equipment were expressed in a report
submitted in June 1875. The classes taught and the number
of students enrolled in each was reported by Professor
Philbrick as follows:

**Fall Term**

- Mechanics to a class of five
- Perspective Drawing to a class of five
- Geometrical Drawing to a class of nine
- Descriptive Drawing to a class of ten.
Winter Term

Analytical Mechanics to a class of four.
Machine Drawing to a class of four.
Geometrical Drawing to a class of nine.

Spring Term

Strength of Materials to a class of four.
Higher Surveying to a class of six.
Land Surveying to a class of fourteen.

Of the number of students attending his classes Professor Philbrick estimated that eighty-three percent were ostentatiously pursuing the course of civil engineering, but added, however, that it was quite evident a "large number would never complete the course." The growing enrollment in engineering classes and the absence of any previous appropriation prompted the professor engineering to list the urgently needed equipment in his report and write that in order to meet in a reasonable degree the demands, some of which I have indicated, it will require in my opinion an expenditure of about $1000.; and therefore, if that amount can be commanded I respectfully recommend that an appropriation of $1000. be made for that purpose.

The list of "more urgent demands," which consisted of pieces of apparatus, instruments and books, together with a request for an appropriation, was read at the regular meeting of the Board of Regents in June 1875. Action on the report was delayed, however, until a finance committee composed of President Thacher and Regents Reeve and Henderson would recommend the general appropriations bill.
On June 26, 1875, the committee recommended that an appropriation of $48,065 be made "for purposes named and existing liabilities." Although the committee recommended that comparative generosity be shown to the law and medical departments, no mention of civil engineering was made. It is to be noted, however, that in an additional appropriation bill accepted on June 29, two hundred dollars were recommended for civil engineering. There seems to be no indication that President Thacher endeavored to have the amount requested by Professor Philbrick appropriated. Similarly, as on previous and subsequent occasions, the President failed at this time to make known the urgent needs of engineering and demand that they be supported.

That the Board of Regents were interested and concerned about engineering and the lack of equipment is evident from the fact that it requested a "detailed statement showing the condition and wants" of the chair, in November 1875. The report submitted to the Regents at this time by the professor of engineering included a list of books, periodicals, maps, plans of United States Public Works and instruments, the cost of which he estimated would amount to approximately $1,184. He indicated also that this list contained the "more urgent wants only." Reporting on the condition of the engineering chair Professor Philbrick wrote:
In explanation of the present condition of the Chair of Civil Engineering as to "apparatus material and furniture" it is sufficient to state, that $200.00 was applied, last June, by the Regents in purchasing Books to supply immediate and pressing demands; and a small amount was applied at the same time on Instruments; and those are the main expenditures for the Chair of Civil Engineering up to date. There are few maps and no ground drawings or illustrations of Public Works belonging to the University. No molds of any description have ever been purchased for this chair and may I add that not a single periodical is provided for those connected with the Civil Engineering course. I have but to add that, in my opinion, a sum not less than $1,200, judiciously applied, as it may well be during the coming two years to supplying the articles mentioned, ... would prove to be highly beneficial to a goodly number of students and others. 49

For those interested in engineering education at the university, and perhaps sanguine enough to expect a growth of the engineering chair commensurate with the industrial interests of the state, the request of the Board of Regents, in November, gave encouragement. Its failure, however, to make some financial provision, either at that time or during its regular meeting, the next April, gave much cause for conjecture. Especially was conjecture in order when considered in connection with the legislative appropriation, of $47,457.00 that was made, in March 1876, "to aid in the present support of the state university in all its chairs and departments", and the subsequent action of the Board of Regents, whereby civil engineering was declared to "be considered a department." To those
interested in engineering the policy and course of action being pursued seemed not only to be contradictory but also a hindrance to progress. It was their belief that President Thacher was too conservative in his educational policy and from them came words of progress. Furthermore, because of his failure to advance the cause of engineering or sustain Professor Philbrick in his demands, the President was accused of being quite willing to lessen the influence of faculty members with the Board of Regents and of seeking to increase his authority in the internal management of the University. That the current belief and charges were not without reason became evident as his policy unfolded. His lack of sympathy for engineering development and his negative attitude in regard to the demands of Professor Philbrick were obvious. Only slightly less obvious was the fact that he had not desired the separation of engineering from the academical department and had sought to throttle its development until it could be reestablished as a course of study. This reestablishment he accomplished in 1877. Capitalizing on the financial depression which began that year and caused the number of prospective engineering positions to be reduced and thereby effected a decrease in the engineering student enrollment, he recommended to the Board of Regents a resolution in which it was declared: "that the Professor of Civil Engineering be and is hereby made a member
of the Academic Faculty." By the adoption of this resolution the engineering department was disestablished and the conservative philosophy of President Thatcher allowed to prevail. Unfortunately, in his earnest pursuit of what he considered to be for the best interests of the University, President Thatcher failed to comprehend the trend of education and embrace its then generally accepted philosophy. This great lack of understanding together with a lack of tact incited criticism that brought the influence of his opponents to weigh so heavily, that the Board of Regents, on June 21, 1877, declared the Office of President vacant. This declaration was followed promptly by another in which one of their number — Christian W. Slagle, was named President of the University, pro tempore.

With the announcement of President Slagle's appointment to the Presidency the outlook for the future of engineering development was greatly enhanced. Practical, honest, and generous in his support of projects intended for public welfare, President Slagle, perhaps better than any other, understood the current needs of the university. To the chair of engineering he gave both his attention and support lest perhaps, in the process of reorganization already contemplated, the academical faculty should effect a revision in the course of study injurious to the engi-
neering chair. To the conservative plan of curricular reorganization proposed by the academical faculty in 1877, and wherein no provision for engineering was made, President Slagle was opposed, and gave staunch support to Professor Philbrick in resisting opposition. Unable to dissuade the academical faculty in its efforts practically to eliminate engineering, the professor of engineering requested and received the privilege of appearing before the Board of Regents to state his views. 

Confronting the Board of Regents on March 6, 1878, Professor Philbrick gave a report on engineering that was enlightened, logical, and accurate. Speaking of engineering and engineers in general he declared:

that from whatever point the subject be considered the conclusion reached is the same - that Engineering has every claim to the rank of a Department, that any other line of study possesses; and that it should be treated as a Department the component elements of which are of a kindred nature ... the idea that Engineering can be consistently treated as "a course of study" of a literary institution results from several causes.

In the first place Eng. studies are pursued to some extent in many Denominational Schools. In most of them however, Surveying in one or more forms with perhaps Drawing, constitutes the principle part of the instruction in the Engineering line. All this tends to belittle the profession and to beget and foster the idea that it is naturally subsidiary to something else. Such surroundings are poorly calculated to generate correct notions in regard to the height and depth and grandeur of the
Engineering Profession. Again the title of Prof. of Civil Engineering is in itself misleading. ... a teacher of C. Eng. — is able to teach the technical subjects of Civil Engineering only and in our best schools a number of men are required to do even that. The truth is there are several teachers more or less closely connected with the studies pursued under the head of Civil Engineering just as there are several teachers more or less closely connected with the studies pursued in a Literary College. 64

Because the number of distinct literary courses that might be formed from the range of literary studies could never exceed the number of really differing courses which naturally come under the heading of Science or Engineering he asserted that,

The Civil Eng. must know more of Science in general than any other. For example the whole range of pure mathematics is necessary as an introduction to the various branches of applied mathematics — which in turn cover but part of the Engineering field. 65

The knowledge of a well informed engineer, declared Professor Philbrick, must extend in a general way to a large variety of subjects and a special knowledge of a large majority is required. More than any other, perhaps, has engineering knowledge and its application shaped the course of our civilization which

will advance as Engineering advances; and Engineering is surely the most important factor in the problem of civilization. And this conclusion is justified both by observation and by "a priori" reasoning. The advance of civilization can be traced by the progress of Engineering works and the Science of the Engineer. 66
The importance of the engineering profession in the advancement of civilization should give it almost the prime consideration in the proper classification and division of subjects in university departmental organization. On this basis he concluded that:

If the number of Depts. must be reduced let that which has the best right stand. Let that which comes in contact with the world at most points Stand. .... The Engineering Dept. alone and certainly a Dept. of Engineering and Science includes nearly all College Studies, except the Ancient languages.67

To remove any doubt in regard to the fact that a general Scientific Department would serve as a nucleus for similar interests and give greater prestige to the University, Professor Philbrick concluded by reminding the Board of Regents that older and more fixed institutions of learning than the University of Iowa were giving way to the just demands of Science and resting more and more their fame upon its prosecution and progress. .... The successful teacher draws his inspiration from above — not from below; and State Universities can never gain prestige by imitating Schools of lower grade. 68

Following Professor Philbrick's report the question of reorganization was referred to a committee of regents for further study. The inquiry started almost at once, was not completed until after the appointment of Josiah L. Pickard, to the Presidency. Superintendant
of Schools in Chicago prior to his appointment, President Pickard was a professional and progressive school man and under his guidance, in June 1878, the committee's study was completed and the School of Science and the School of Letters established in the Collegiate Department of the University. The new plan as adopted by the Board of Regents included the following provisions:

First — The University shall comprise four Departments which shall be styled
1. The Collegiate Department.
2. The Law Department.
3. The Medical Department.
4. The Homoeopathic Medical Department.

Second — The President of the University shall be the President of the Faculty of each Department and of the Sub Faculties of each Department.

Third — The Faculty of each Department except the Law Department shall constitute one of their own number the Dean thereof. ....

Fourth — The Collegiate Department shall comprise the schools — one of which shall be styled the School of Letters and the other the School of Science.

Fifth — The Faculty of the Collegiate Department shall be divided into two Sub Faculties — one of which shall be styled the Faculty of Letters and the other the Faculty of Science.

Sixth — The general interests of the Collegiate Department shall be under the control and direction of the Collegiate Faculty. The special interests of the School of Letters shall be under the immediate control of the Sub Faculty of Letters, and the special interests of the School of Science shall be under the immediate control of the Sub Faculty of Science.
The seventh provision listed the members of the general faculty that would make up the "Sub Faculty of Letters" and the "Sub Faculty of Science." In this division the Professor of Civil Engineering was listed as a member of the latter.

Eighth - The Sub-Faculties shall choose from their own number a chairman and the chairman thus chosen and the President of the University shall constitute an advisory Board to which all students shall go for information and advice concerning the studies which they should pursue whilst in the University.

It was indicated in the ninth provision - that the President should be the presiding officer in both the general and sub faculty meetings.

Tenth - The Sub Faculties by the March Meeting of the Board of Regents in A. D. 1879 shall submit to the Board definite Courses of Study for their respective Schools and the terms of admission together with the style of degrees to be granted by the University to students accomplishing the Courses of Study established in said Schools respectively.

Eleventh - The advantages of the University in all of its departments shall be offered and secured to all students in Special Studies. The Faculties, Sub-Faculties and all Professors and Instructors are required to give special and irregular students the same attention, to subject them to the same examinations in the class room and to treat them in all respects the same as students in regular courses of study.

To Professor Philbrick the division into the two schools seemed most apt and natural. Between science and letters he considered there was "little in common either in the means of teaching, methods of
teaching or the objects sought." Furthermore, he felt it was unwise to place the affairs of engineering or the sciences in the hands of a faculty which was interested predominantly in the literary phase of education. To Professor Philbrick's way of thinking, the School of Science with engineering as a major course, provided an organization that was most acceptable and its abolition, in 1885, was a contributing factor to his resignation two years later.

The School of Science and the School of Letters were organized under the guidance of President Pickard. At a meeting of the faculty on June 22, 1878, it was

Resolved that the sub faculties as contemplated by action of the Board of Regents be requested to take into consideration the question of changes that should be made in the course of study or in the terms of admission, and report to the general faculty at as early a date as practicable any changes that should go into effect at the commencement of the Fall Term, 1878.

Following the adoption of this resolution the general faculty was resolved into the sub-faculties of the School of Science and the School of Letters for the purpose of "organization and consultation." The members of the sub-faculty of the School of Science after electing Professor Hinricks, Chairman, and Professor Philbrick, Secretary, proceeded to consider the desirable changes in the course of study which should be effected in the Fall Term. It was agreed that in Civil Engineering
the work in Drawing during the second term should be made much more practical by an added use of "Objects" and "Models." The course in Perspective Drawing which was to be followed by a more general treatment of Shades and Shadows. It was further agreed, that extra time should be devoted to Mechanical Drawing and Architecture. With the changes, which were to become effective, in September, 1878, determined, the sub-faculty of the School of Science was ready to setup courses of study for Engineering and Science. Professors Philbrick and Calvin were appointed to plan a course of study for the freshmen. After spending much time in deliberation they submitted a course of study to the sub-faculty of science. As adopted by this faculty on November 1, 1878, all freshmen in the School of Science were required to take the following courses:

**Fall Term**

Solid Geometry and Plane Trigonometry.
Natural Science, which should consist of Physical and Natural Science, Drawing and fine exercises in Practical Astronomy. Language - German or Latin.

**Winter Term**

Mathematics - Special Trigonometry.
Practical Science - Physical Science and Drawing.
Language - German or Latin.
Spring Term

Mathematics - Analytical Geometry.
Practical Science - five exercises in Practical Astronomy, Physical and Natural Science and Drawing.
Language - German or Latin.

The course of study in engineering for students other than freshmen was planned by the sub faculty of the School of Science and together they were submitted to the Board of Regents in March, 1879. Maintaining the same rigid class-course system as that found in the earlier curriculum, each year was characteristically divided into three terms, and the students were not allowed to take more than three subjects. At the time of their first registration each student was required to elect one of the four courses offered in the two schools and pursue it the entire four years. Permission to change courses could be secured but, we are told, it was rarely asked.

The aim of the revision was "to reduce the number of studies required of all and increase facilities for a better prosecution of elective studies." On these points, however, it is to be noted that there was little change from the previous course of study. Purposely, the sub-faculties endeavored to keep some distinctive feature which should mark each course in each of the two Schools. In the School of Letters two-thirds of the studies are Literary and Philosophical—one-third scientific. In the School of Science the order is reversed and two-thirds of the studies are scientific.
As submitted to the Board of Regents at its Spring Meeting in 1879, the engineering course of study after the freshman year was as follows:

Sophomore Year.

Fall Term.
Analytical Geometry, 3 Dimensions.
Perspective Drawing.
Surveying.
English Literature - German or French.

Winter Term.
Descriptive Geometry.
Differential Calvulus.
Zoology or German.

Spring Term.
Integral Calculus.
Physics.
Botany.

Junior Year.

Fall Term.
Topography Surveying.
Mechanics.
Optics.

Winter Term.
Strength of Materials.
Chemistry.
History or French.
Spring Term

Drawing.
Geology.
French, English Literature,
Meteorology or Calculus.

Senior Year.

Fall Term.

Field Engineering
Astronomy.
History, Mental Philosophy or
Geology.

Winter Term

Bridges and Roofs.
Two electives from the group of
Political Economy, Mathematics,
Astronomy and Didactics.

Spring Term

Hydraulic Engineering
Thesis. 89

Students not planning to present themselves
for graduation were allowed to "select their studies from
the four courses, under direction of the faculty." To
become eligible for the degree of Civil Engineering, how­
ever, students were required to complete the engineering
91 courses as outlined. Designed to meet the engineering
needs of the State the course of study adopted at this
time was followed without fundamental change until
1885. Offering a greater opportunity for course
selection engineering in this period took its proper place in the academic roster of the Collegiate Department and for the first time, it can be said, became a living organism in the University curriculum.

In 1885 it appeared to some that the division of the collegiate department was no longer necessary. With the attempt to make the curriculum strictly classical, no longer present, and similar requirements in both schools, members of the science faculty, with the exception of Professors Philbrick and Hinrichs, made a gesture in the direction of change. At a meeting of the Science faculty on December 19, 1884, a number of changes in the course of study were considered with a view to concentration in the later portion of each course. After freely discussing the subject it was decided that a detailed study should be conducted and that courses outlined in the Harvard, Yale, and Michigan catalogues should be "made the basis of examination." On February 20, 1885, the faculty in the School of Letters took similar action. It was now evident that an extensive revision of the course of study was under way. The aim of those promoting the change was to bring the curriculum, engineering included, and the practices of the University of Iowa, more in accord with those of other leading universities. In 1880, the President of the University of Michigan reported to the Board of Regents that there was no longer greater
emphasis on the classics than upon other subjects in his institution. President Pickard had already declared his interest in the establishment of a balance between the classical and scientific course of study. This educational trend accepted and expressed by the two Presidents was not entirely unknown or new to the Board of Regents. Interested in education and the position taken by other leading universities in regard to the course of study they were not unacquainted with the elective principle advanced by Dr. Eliot of Harvard. Consequently the proposed change not only met with little opposition, but was readily accepted at the University of Iowa.

After a preliminary study had been completed the sub-faculty of the School of Science, meeting on February 24, 1885, began to remodel the civil engineering course of study. Professor Philbrick proposed the following requirements which were unanimously approved. The subjects proposed with the time requirements for each were as follows:

- Drawing — — — — — — three terms
- Pure Mathematics — — — five terms.
- Applied Mathematics — — — five terms.
- Descriptive Geometry
  and Stereotomy — — — one term,
- Surveying and Mapping — — — three terms.
- English Literature — — — one term.

In addition to the eighteen terms of required work indicated, the candidate for a degree in Civil Engineering was required to take six terms of work in
science. Other work was elective and the student was free to make a selection from courses offered in the University curriculum.

Accompanying the course of study submitted to the Board of Regents and approved on March 3, 1885, was the following recommendation already adopted by the faculty of the School of Science.

Whereas, all students may be admitted to the collegiate courses of study with the identical preparatory training; and

Whereas, at the end of their four years of study at this college they may have pursued almost the same studies in either of the four courses now made so largely elective; and

Whereas, they may have taken these studies even in the same order of succession, since the bars between the four college classes are almost on the ground; and

Whereas, all graduates of this college do receive the same final degree of A. M. in course; therefore,

Resolved, that hereafter all students completing either of the four courses shall receive the same bachelor degree of A. B.

Resolved, that the second degree heretofore uniformly A. B. shall be so modified as to indicate the particular line of study pursued after graduation.

Vehemently opposed to such a resolution the faculty of the School of Letters, in ridicule, promptly presented a resolution recommending that all graduates receive the degree of Civil Engineering. The faculty resolutions were tabled by the Board of Regents.
It was evident at this time that the sub-faculties were divided not only within themselves but in their relation to one another and the need for an integration of interests in the Collegiate Department became apparent to the members of both faculties. According, on June 17, 1885, the general faculty adopted the following resolution:

Resolved 1st. That the faculty of the Collegiate Department respectfully request the Board of Regents to abolish the present system by which our members are for a part of our supervisory work divided into two faculties known respectively as the Faculty of the School of Letters and the Faculty of the School of Science.

2nd. That all questions of the requirements for the different courses and degrees the literary and scientific professors shall constitute two committees, with power to act

The resolutions were submitted to the Board of Regents and on June 20, 1885 after discussing the proposed change requested by the faculty the following resolution was passed:

Resolved - That in response to the resolution of the Collegiate Faculty requesting the Board to abolish the system whereby our members are for a part of our supervisory work divided into two faculties known respectively as the Faculty of the School of Letters and the Faculty of the School of Science.

We do hereby order such abolition and that in lieu thereof the Professors specifically concerned with the Literary Studies constitute one Standing Committee of the General Faculty and those specially concerned with Scientific Studies constitute another Standing Committee and that
the chairman of each of these Standing Committees together with the President shall constitute an Executive Committee of the Collegiate Faculty.

Professor Philbrick having been largely instrumental in bringing about the organization of the School of Science and Letters, in 1878, strongly opposed their abolition in 1885. He claimed that by such an action the scientific interests of the University were "seriously injured" and that engineering was placed under "great disadvantage." With clarity of educational foresight he called for independent management, under the Regents, similar to that in the Law Department. Educated in engineering he was determined to make the school one of wholly practical education and his opposition to the members of the faculty who sought a fusion of "practical" and "liberal" educational philosophies was an expression of his conviction as well as the conviction of others who strongly believed in so-called "practical" as opposed to "liberal" or "classical" education. Never reconciled to the abolition of the School of Science Professor Philbrick undoubtedly overestimated its importance in explaining the increased enrollment and the increased demand for engineering courses, after 1878. Without minimizing the new organizations' contribution to engineering development, it must be recalled, that at this time, a return of better economic conditions in all parts of the country gave an opportunity
of securing an education to many and also promised greater engineering opportunities for trained engineers.

So great was the enrollment in engineering classes and the demand for further engineering instruction that Professor Philbrick requested the appointment of a "regular assistant possessing qualifications for instruction in engineering." For this Assistantship he recommended John F. Polley, C. G., a former student and graduate of 1876. Of him Professor Philbrick wrote:

Mr. John F. Polley is a fair mathematician and has proven himself to be an efficient teacher and excellent Draftsman, to say nothing of other qualifications. I believe he is a most suitable person for the position of assistant Professor of Civil Engineering in the University.

After making his request for an assistant Professor Philbrick gave a graphic description of the conditions under which engineering instruction was conducted. In regard to rooms and models he declared:

The rooms at my disposal are insufficient for the use required of them. There is too little room for the desks required for the larger classes and there is absolutely none at all for the temporary rest of moulds and materials for their use. We need more blackboard room and room for the illustrative drawings of the Teacher.... The models in possession of the University (at least some of them) furnish a part of the material for teaching Model Drawing.... A more commodious room should be provided for them so that they may be more accessible.

Some models for teaching Descriptive Geometry are much needed. .... Models also to illustrate formula for the volume of some of the more complicated geometrical solids are much to be
desired. They are needed especially in
Earthwork discussions but are not without
value in other parts of the course. .... A
Metric Leveling Rod is necessary that we
may use the Metric system in Surveys as
well as in the Drawing room. 117

As an explanation for such a lack of equipment and
also as an argument to justify a more generous con-
sideration in any appropriation that might be made for
engineering he stated that,

The University so far as I know has never
expended a dollar in supplying illustrations
of any of the important Engineering works of
the country, though these would in a certain
degree acquaint all who might look upon them
with some of the great things of the world....
and would furnish excellent examples for the
guidance and stimulation of the few. She (the
University) is not altogether wanting however
in illustrations of other times and other
things which the civilization of the present
world has outgrown and which to imitate would
be destruction. I think this state of things
not creditable to the University and that it
ought to be completely changed.

The Engineering Library is small and ought
to be increased. If funds for the purchase
of books could be invested by persons inter-
ested in different lines of thought a much
more valuable collection might be made than
is possible to procure under the present plan.
At present the School of Science is complete-
ly ignored in the choice of books for the
general Library though it would seem a modern
University Library ought to be quite in
sympathy with Science. While the Science
Faculty has no voice in the expenditure of the
general funds for the purchase of books it will
be necessary to depend upon special appropriations
alone and I therefore make my plea for an appropri-
atation for books. 118

The condition of the engineering department and its'
needs as described by Professor Philbrick were referred by the President to the Board of Regents at their June Meeting, 1879. After due consideration, the request for an assistant was referred to the committee on faculties and teaching and that for more room to the executive committee with orders "to provide such additional room as may be at their disposal." The committee on faculties and teaching elected John F. Polley to the position of instructor of Drawing and Field Work. The executive committee though eager to alleviate the congestion was unable to provide more room for engineering because of the crowded condition of every department. Although the Board of Regents at this time discontinued the Preparatory Department and anticipated that "needed room" for collegiate classes as well as for the professional departments would be thereby provided, President Pickard reported in September, 1879, that

We have been compelled to use all available space in the buildings....The School of Engineering has not the needed rooms, and yet no more can be given the classes now crowded into small rooms.

With nearly a thirty-three percent gain in the collegiate classes and a gain of nearly thirty percent in the professional departments during the first year after the Preparatory Department was closed, President Pickard reported that fifty percent of the loss in numbers was made up at the opening of the first year and that he expected
the figures to be over seventy five percent by the close of the second year. Although all departments in the University were crowded and in need of more room the congestion in the engineering rooms was so bad that President Pickard declared in a report to the Regents under the date of October, 1880, that a need I would emphasize, is for rooms suited for the wants of the Professor of Civil Engineering. In connection with this department we must have at no distant day an Art Department such as is made so prominent in the Illinois Industrial University. If the Medical Department can have a building of their own we can utilize the Lecture Rooms they now occupy for Civil Engineering.

The unexpected growth of the University made the erection of new buildings imperative. Advised of the crowded condition, the General Assembly merely allowed the law of 1878 to continue and satisfied itself that from a "consideration of justice and public policy" the University continued "to receive at the hands of the General Assembly a liberal support." So demanding was the need for more room that the Board of Regents, in 1881, declared, there was an "absolute need" for "at least two more buildings" and Governor John H. Gear in his Second Biennial Message after reiterating the report of the Regents, called for an enlarged appropriation and declared that the "crowded condition of the buildings," at the University, "is such that it is almost a physical impossibility for the institution to do justice to the students."
Deaf to the urgings of the Board of Regents and the Governor, the General Assembly delayed action until a report was received from its Visiting Committee. The report was made by the committee after the subject had been studied "from an entirely impartial standpoint" and recommended the appropriation of eighty thousand dollars in addition to the permanent endowment. Confirming the report of the Regents and the President in regard to the crowded conditions, the Committee, after describing the inadequate quarters occupied by the Chemistry classes, declared that the hall devoted to engineering will accommodate only twenty stands for drawing - hence to provide for the fifty students in attendance, a triplication of the lessons is necessary.

To provide adequate space for the students attending the University the Committee sustained the Board of Regents and recommended the erection of two new buildings. Opposition to such munificence quickly appeared and before the legislature could act it was urged to "draw the line" and "end the annual increasing drafts upon the treasury."

Through the efforts of Doctor J. C. Shrader, at once, a member of the medical faculty at the University and the Iowa General Assembly, and other friends of the university the opposition was defeated and an appropriation of fifty thousand dollars in addition to the annual twenty thousand was secured. The appropriation indirectly helped engineering since thirty thousand dollars were designated
for a new medical building and upon its completion and occupancy, in December 1882, the rooms vacated in South Hall were assigned to Civil Engineering.

The increased room for engineering was insufficient but it stimulated Professor Philbrick in his demands. In his report of June 16, 1882, he declared that:

> Among the wants may be mentioned additional Drawing desks and a suitable room in which to use them. These needs are, if I mistake not, to evident to require words to state them; and yet the Faculty of the School of Science has taken action looking to the immediate increase of Drawing in both the Scientific and the Engineering courses of study. This increase in the amount of Drawing will render the present rooms, apparatus and facilities still more inadequate to the demands than they are at present. 137

In the same report he indicated that there was a great deficiency of materials, books and instruments. Reporting the urgent need, he declared,

> Our wants in the direction of maps, charts, etc., remain substantially as heretofore; and we have no place whatever for keeping the material necessary to illustrate the processes of Drawing or the Drawings themselves. I am anxious that the comparative success attending the classes of the past may increase with those of the future; and one prominent means of increasing the probability of such a result, is to provide the proper conditions for the doing of good work. We are in need of additional works of reference in the principal subjects constituting the main divisions of the Field of Engineering. The need of additional Instruments is, I think too apparent to call for special remark. 138

Despite the urgent demands of Professor Philbrick in his June report and the request of the faculty of the School
of Science for two thousand dollars to be used in purchasing apparatus and appliances, during the year 1882 and 1883, engineering fared rather badly. Allotted only one third of its request by the financially hard pressed Board of Regents, the chair of engineering received only a hundred dollars. The time had come when the necessity of making some provision for the School of Science and hence engineering was very evident and could no longer be brushed aside. With student enrollment greatly increased and room space no longer available, the Committee in making its report to the General Assembly on the need for better and more suitable accommodations, declared that a new building to accommodate the School of Science is a "positive demand."

The General Assembly responded to the recommendation of the Committee. In each house there were a sufficient number of university graduates as well as other friends to secure the passage of two laws providing for the needs of the University. Although some opposition was anticipated particularly, in Iowa City, where the unsympathetic feeling of state citizens for the University was exaggerated, the laws passed without a dissenting vote. Requested by the Board of Regents for an increase of twelve thousand dollars in the income fund, the Assembly manifested great generosity and granted sixteen thousand. At the same time it was voted to
increase annually the twenty thousand dollar endowment by eight thousand dollars. The second law enacted provided $64,500 for the use of the University during the biennium. Of this sum $45,000 was designated to be used on a building for the School of Science. Over fourteen thousand dollars was granted to equip the new building.

It was with great enthusiasm that the faculty of the School of Science welcomed the prospect of both modern and enlarged facilities. Three days after the act was passed making the erection of a new science building possible a resolution was passed by the faculty requesting the Board of Regents that "arrangements...be made at the earliest possible date" for the construction of the new building so that it would be "ready for occupancy in the fall of 1885." Aware of the imminent need for the building, the Board of Regents held a special meeting to "consider the question in regard to its construction, location and assignment." Before the meeting adjourned a special committee was appointed to conduct an investigation and report at the next Regent meeting in regard to whether or not a building could be "constructed so as to accommodate ... natural science, physical science and engineering or any two of them," yet constructed, "With a view finally to be used by one." Because the branch of science for which the building had been intended was
not specified by the legislative act, the Board of Regents, after a motion to devote it to the physical sciences was defeated, assigned the building to the chair of natural science and temporarily to engineering. The new building was completed, in December, 1885, and at that time the location of engineering was transferred from South Hall. Because of the growth of Natural Science it was transferred back to South Hall ten years later where it occupied the basement and first floor.

It should not be concluded from the rather impetuous remarks and demands for equipment made by Professor Philbrick that engineering was treated badly by the Board of Regents and the General Assembly, after 1878. By way of comparison, the General Assembly was liberal in making appropriations and the Board of Regents endeavored to make provision for all departments in the university. The growth of the university at this time was unexpectedly rapid and every department was in need of more room and equipment. All could not be satisfied at once; hence wisdom demanded that some rule of priority be established. It was the responsibility of the General Assembly and the Board of Regents to view and provide for the total university of which engineering was apart.

Professor Philbrick, unfortunately, was apparently unable to appreciate the university in its totality. To him, the department of engineering was the university, and
because of an enthusiastic desire to promote that department he seemingly became provincial and narrow in his perspective. This almost selfish attitude on the part of the Professor contributed, at least in a large measure, to the unharmonious and unpleasant relations which came to exist between himself and the Board of Regents and ultimately caused him to resign.

That salary was a contributing cause for enmity between Professor Philbrick and the Board of Regents may be gathered from his report to the President, in June 1881. Herein he declared:

the salary paid Mr. Polley is inadequate to the service rendered by him. In fact he receives no more than is paid for a lower grade of work and not so much as some receive for a similar grade of work. As no one is over paid he must be underpaid. It is morally certain that Mr. Polley can command a higher salary elsewhere than is paid him by the University; but since this is true of others including members of the faculty, I need say but little about it.

I hope that there may be an increased salary to all and that it may begin with the Chair of Engineering where all things considered the pay is least. 183

And this time Professor Philbrick was receiving an annual salary of $1615.00 and Mr. Polley nine hundred dollars annually. The meagerness of the salaries would seem to justify a raise but it is to be noted that both were in conformity with the university wage scale at that time. The Board of Regents refused to grant the
request for an increase in salaries. Undismayed by the Regent's refusal, Philbrick reiterated his request the next year in the following manner:

I feel bound to call attention to the fact that the Instructor of Drawing, Land Surveying, etc. receives much less pay than the assistant Professors who like wise teach Applied Science of no higher grade. I would respectfully ask that Mr. John Polley be made Assistant Professor of Civil Engineering with the corresponding salary. 166

Again the request of Professor Philbrick was disallowed by the Board of Regents. The refusal to make any faculty promotions that involved an increase in salary was probably due to the regent's desire to curtail expenditures of this nature until the medical building, then under construction, was completed. Following the action of the Board of Regents Mr. Polley tendered his resignation which was accepted, much to the chagrin of Professor Philbrick, on June 19, 1882. On June 21, the task of securing a successor was referred to the Executive Committee. Very soon, and with the approval of Professor Philbrick, the committee employed William E. Crane, C. E., at a salary of nine hundred dollars per year.

Enthusiastic and systematic in his work Mr. Crane did much to increase the efficiency of instruction in the engineering course and on June 20, 1885, upon the recommendation of President Pickard he was made an Assistant Professor, without an increase in salary.
Although he accepted the promotion, he indicated at that time, that he would be unwilling to remain longer than another year unless he received a substantial increase in salary.

An efficient instructor, Mr. Crane was ranked very highly and considered a definite asset to the engineering department. For this reason the Regents were most anxious to retain him on the faculty, after June, 1886. The method they employed, however, was most blundering and created an impossible situation which ended in his dismissal and gave added cause for Professor Philbrick's resignation a few months later.

Because the going of Mr. Crane was considered a great loss to engineering at the University, and he "positively" refused to continue any longer in his present capacity, Regent Grosley offered a resolution, "that a chair of Drawing and Railway Engineering be established and that W. E. Crane be elected to fill the same at a salary of $1500.00 per annum." Although, when put to a vote the resolution was defeated another of similar nature was offered, on the same day, by Regent Matthews and was adopted. As adopted the resolution provided that,

the position of associate professor of Civil Engineering be substituted for assistant professor, that such associate professor have charge of drawing, land and railway Surveying. That Professor W. E. Crane be elected to that position at a salary of fifteen hundred dollars per year.
The action of the Board of Regents was promptly communicated to Mr. Crane by a letter from William J. Haddock, Secretary of the Board. Professor Philbrick never having been consulted in the matter took exception to the action of the Board of Regents and communicated his attitude and the position he held, in very definite language. In his letter addressed to the Board of Regents and read at the Regents' meeting on October 13, 1896, Professor Philbrick wrote:

Last June, contrary to my known and expressed wish, Mr. Crane was made an Associate Professor of Civil Engineering, his salary being raised to $1500. I wish to set forth for the purpose of an understanding of the matter, the facts in the case. Mr. Crane was appointed an Instructor in Engineering at a time (1883) when no one, in the opinion of the Professor of Engineering, better qualified to fill the position available. He has been continued from time to time, with the express understanding that he asked to stay but a year for the purpose of making his transition to the field to the best advantage. To the field he was always anxious to go, and to the field I was always anxious to have him go, and always advised him to go. I have told him again and again that I could not retain him here, but wished him to make the best use of his opportunities here, to better his conditions outside.

Last June, Mr. Crane asked me to retain him another year, and to recommend his promotion with an increase of pay in order that he might appear to better advantage I suppose during the year. This request I pointedly refused for the following other reasons:-

1. He was receiving all he could earn and so I told him. His services were, of course, never satisfactory to me, but latterly he has
become more "rattled," unreliable and untrustworthy than formerly, and has consequently given me more trouble.

2. It was easy to find a better man and at no increase of salary.

3. His proposition was in violation of the confidence reposed in him, and I then believed him capable of thrusting himself upon me, if he could contrary to my wishes. Such proved to be the fact. I was naturally filled with indignation to have a subordinate presume to dictate about my affairs and to force himself upon me as Associate Professor.

Now in the face of all this, and without so much as giving me an opportunity to protest, the Board did last June, actually make Mr. Crane an Associate Professor of Civil Engineering — an associate Professor of mine.

If after rendering so much service in building up, so far as I have been able in the face of an always active opposition, the Engineering Department of the University; receiving for my work less pay than anyone else anywhere receives for services of equal grade; if after all this, this Board purposes to give me no voice what ever in determining with whom I shall associate, and who shall be Associate Professor with me, then this is the latest day upon which I can afford to find it out. I respectfully ask the Board to relieve Associate Professor Crane from the University where he has more than filled the days of his usefulness and to appoint an Assistant Professor the man recommended by me last June, or some other suitable person.

The blast of Professor Philbrick was more than the Board of Regents had anticipated. They were now confronted with making a choice between accepting the resignation of the Professor or removing Mr. Crane. They chose the latter and called upon Mr. Crane to resign by adopting a resolution, in which they declared it to be
the sense of the Board that the best interests of the University require the resignation of W. E. Crane as Associate Professor in the Engineering Department to take effect at the end of the present term.

The victim of the Board of Regents' blunder, Mr. Crane refused to comply with their request preferring to consider their action as a dismissal. The great effort exerted and the extorting method employed to secure his resignation is evidenced in a letter written under date of October 14, 1886. Writing to the Honorable J. F. Duncombe of Fort Dodge, Mr. William Haddock, Secretary to the Board of Regents asserted:

I spent most of the day on the Crane and Philbrick matter. I endeavored to have your views and the views of the Board carried out by showing Mr. Crane the advantage of his handing in a resignation - in fact I explained the whole matter to him. Mr. Crane absolutely and flatly refuses to resign. He says the fault is entirely with Prof. Philbrick and that he won't resign to oblige him. He will get ready he says and leave on or at the end of this term as provided in the resolution.... I pointed out his standing in the matter and he thinks that is easily cured by adhering to the truth in fact and by adding to the resolution calling for his resignation the following words - "This action is taken on account of irreconciliability between Prof. Philbrick and Prof. Crane."

Public opinion did not respond kindly to the action taken by the Board of Regents in this matter. Best expressed, perhaps, in the Vinita-Reporter it exonerated both Professor Philbrick and Associate Professor Crane, and placed the guilt where it properly belonged. Asserting
that:

It would have been well in the first place if the Regents had more carefully contemplated what effect the promotion was likely to produce. Professor Philbrick has filled the chair of Civil Engineering for many years and has filled it ably, but if an associate was necessary in June an associate is required now. Either in June or in October a mistake was made. If the promotion was wise, the deposition was not, and vice versa. We do not pretend to judge the case. The Regents should have been able to do so. The necessity that dictated the employment of an associate professor should have been a necessity of more weight than the personal feelings of anyone man. Whether it was such we do not give an opinion, but we are inclined to suspect from the hasty undoing of their action by the Board that no very important considerations influenced their course in the first place. We believe that neither the honor of Prof. Philbrick nor that of Prof. Crane is implicated in the affair. It is altogether an unfortunate matter.

Of the charges against Mr. Crane laid before the Board...he was, after complete investigation exonerated. Mr. Crane goes away from us bearing a good name, and with a record behind him of good faithful work.

In order to express their sentiments in regard to Mr. Crane and assert publicly their dissatisfaction at his removal, fifty-three former students signed a testimonial which together with their names was published in the Vidette-Reporter, on October 30, 1886. In it they declared:

Whereas, It has pleased the Honorable Regents of the S. U. I. to remove from his position in the institution, our able and esteemed teacher, W. E. Crane, therefore,

Resolved, That we profoundly regret the action of the Regents in this matter, and extend to Prof. Crane our best wishes and sincerest sympathy. That in his loss we are deprived of a faithful, earnest, energetic and efficient instructor.
The order of the Board of Regents remaining unrescinded, Associate Professor Crane gave up his duties in the Engineering Department on October 25, 1886. Following his departure from the department in a letter to the Board of Regents he asserted:

On October 13, '86 I was dismissed from the University without a hearing on charges preferred by Professor Philbrick. Said charges reflect upon my competency and faithfulness as an instructor while in the University. My dismissal under the circumstances is in my judgment unmerited disgrace. I respectfully ask the Board to investigate the charges. Examine the graduates and members of my classes still in the University and if the charges are found to be true then I hope you will do me the justice to state the fact and make it as accessible to the public as are the charges of Professor Philbrick. If my work has never been satisfactory to Professor Philbrick he has been negligent in his duty, for until I was made Associate Professor of Civil Engineering he has never troubled himself to examine my work or offer a single suggestion as to how it could be improved. It was not unsatisfactory to him until after the action of the Board last June. He has never intimated "I was expected to stay but a year" or that "he could not retain me," and I did not ask him to retain me. The charge of being "rattled" what ever that may mean is too frivolous to need any notice whatever. I have only my honor and reputation for probity faithfulness and efficiency. I respectfully ask to be relieved from the unjust imputations that dismissal under the circumstances involves.

This letter, signed by Mr. Crane was read at the meeting of the Board of Regents in November but no further action was taken. Conscious of their serious blunder, perhaps, and undoubtedly weary of the whole unfortunate episode, they brushed the letter aside with a
motion that it be tabled and proceeded to direct their attention to the consideration of Mr. Crane's successor and the rank that should be his.

On October 30, 1886, the Executive Committee tendered the position which Mr. Crane vacated five days earlier, to Charles Scott Magowan, C. E., and on November 5, he accepted the offer, becoming assistant professor of Civil Engineering and receiving a salary of twelve hundred dollars per year. This action was confirmed by the Board of Regents after President Pickard recommended Mr. Magowan as one of excellent scholarship and character. "He is worthy," said the President, "to receive an election at your hands as Assistant Professor of Civil Engineering. Professor Philbrick has requested such an election." To this position he was elected by the Board of Regents but not until after they had adopted a resolution in which they

Resolved: That the resolution of the Board of Regents adopted June 24, 1886 substituting the title "Associate Professor of Engineering" for the title "Assistant Professor of Engineering" be rescinded and that the title of "Assistant Professor of Engineering be restored."

The discord between the Board of Regents and Professor Philbrick was greatly intensified on November 23, 1886. On this date a "claim of Prof. Philbrick for Engineering work for the University for thirteen years past in sum of $167.25 was filed and called up and read and considered."

After considering the professor's
claim to remuneration on motion the matter was "tabled".

This action brought from the pen of Professor Philbrick a communication which was read at the Regents Meeting, on February 28, 1887. Calling the Regents' attention "to a bill for Engineering services" submitted "on the occasion of your November meeting" the professor explained.

The work referred to in the bill was entirely outside of my duties as Professor of Civil Engineering; and therefore the bill was in my opinion entirely proper. If I had but little to do as a teacher I do not see that I would be obligated to do outside work gratuitously; but statistics show however that I have always done more teaching than any other Professor in the University, not with standing the element and character of much of the work done by others.

Again: I was certainly led to believe that the work referred to would be paid for; and that belief being at the same time reasonable, and founded on custom as well, I entertained no doubt of its correctness and presented my bill accordingly....

Upon hearing the second appeal for remuneration together with a new claim

for extra compensation for services in teaching classes for the assistant to the chair of Civil Engineering during the absence of the assistant on account of sickness for fourteen days the sum of $136.28,

the Board of Regents repeated their action and "tabled" the entire bill. Incensed by the action of the Board of Regents, Professor Philbrick now submitted his resignation. In a communication received by the Board of Regents on March 1, 1887, he stated:
Gentlemen:

Desiring to leave the University I again tender my resignation as Professor of Civil Engineering to take effect as early as June next.

Yours truly,

P. H. Philbrick 190

The resignation was promptly accepted by the Board of Regents. Learning of the Regents' action, Professor Philbrick appeared before them on the following day and requested that he be granted a leave of absence beginning about May, and after proper provision had been made for his classes. In lieu of this request the Regents rescinded their action of March 1, in order that the Professor might withdraw his resignation and amend it "to take effect at the end of the present school year, August 31, 1887." The amended resignation was filed and accepted on the same day. Enclosed, however, with the resignation was Professor Philbrick's request for a leave of absence, "during the month of May, 1887 without loss of pay." The Board of Regents moved that this request be granted, on condition that he release "his claims under bills heretofore filed and disallowed."

Unwilling to relinquish his claims, he remonstrated by letter, under date of March 30, 1887, but received no consideration from the Regents.

An additional information to you, and as a reason for an unconditional leave of absence for me, allow me to state that, during
the term just closed, I have for the accommoda-
tion of the Faculty and students given instruc-
tion outside of the regular studies of the term, 
and as extra work to me, as follows:—

W. A. Darling Bridge Designing
Miss M. Preston Arch.'l Drawing
* E. J. Brockry Top.'l *
* Kate Hudson * *
* Slotterback * *

I have no desire to parade the extra work 
done by me, but only to show that, while connected 
with the University (for the above is not an unfair 
sample) I have not only done more regular work than 
any other Professor in the University, but more 
extra work than all others together.

If, as has been so appropriately suggested, 
accommodation should be mutual; then I submit that 
here is an excellent opportunity for your honorable body to illustrate the principle. 198

The last report, in a feud between the Board of 
Regents and Professor Philbrick, it was, in a sense, the 
end of an era in engineering education at the University 
of Iowa. It was an era during which a "national reputa-
tion" was won by the engineering department. A reputa-
tion, which in great part, might justly be ascribed to 
Professor Philbrick under whose continuous charge 
engineering had been since its establishment, in 1873. 
Vigorously he had championed progressive scientific edu-
cation yet demanding from the beginning, that students 
show an accuracy of knowledge in the subjects that he 
taught. His influence upon those who had the privilege 
of his close association was both deep and lasting as 
were the contributions he made to the department he ad-
his resignation was prompted in part by the inadequacy of salary, described as "much too small for the character of the work done", and because he considered it an opportune time to make contemplated changes to reenter the field of practical engineering by accepting the position of chief engineer of the Kansas City, Watkins, and Gulf Railway in Louisiana, then being laid.
Chapter III
YEARS OF PROMISE — 1887-1899

As a result of President Pickard’s and Professor Philbrick’s resignations at the end of the school year, in 1887, the Board of Regents were confronted with the task of filling two positions on the university staff which vitally concerned the future of engineering. Names of men favored for each position were mentioned by the prominent alumni and in most every section of the State, newspapers discussed the matter freely. In regard to the President it was asserted that he should possess an education both broad and general enabling him to grasp, appreciate and aid the various departments. To succeed Professor Philbrick in the department of engineering, the same sources claimed that a man of no common ability but rather one able "to carry on the work so well begun and make still more excellent a department already excellent," should be secured.

Cognizant of the interest that existed throughout the State and the attention that was being focused upon candidates for the two positions the Board of Regents adopted the following resolution, on March 30, 1887.

Resolved that Regent Richardson be instructed to visit Professor Hardy and ascertain what if anything can be or should be done toward securing him for the position of President and that he be instructed to report the result of his visit with his views to a committee consisting of the Executive Committee and Regents Larrabee and Wright: and
that such committee on such report being made select the President from the following named persons - C. A. Schaeffer, Prof. Hardy, Prof. Coulter and Prof. Emmerton at a salary not exceeding $5000.00. 3

In his effort to perform the task assigned him, Mr. Richardson chanced to ask George T. Baker, long-time member of the Iowa State Board of Education, "whom he would think of as a good President of our University?" Without hesitation, Mr. Baker replied, "I think my old Dean at Cornell University would make an excellent President." Without further recommendation, Dr. Charles Ashmead Schaeffer was invited to visit Davenport. In this visit he made an excellent impression upon Mr. Richardson and other members of the Board of Regents with whom he conferred and before the visit ended Dr. Schaeffer had agreed to become President of the University of Iowa, a position he retained with distinction until his untimely death, on September 23, 1898.

On June 21, 1887, the Board of Regents authorized the committee on faculties and teaching to secure a successor to Professor Philbrick. First candidate to be elected to the position, at a salary of eighteen hundred dollars annually was Arthur Beardsley of Swarthmore, Pennsylvania. Because Professor Beardsley refused to accept the position, presumably, on account of the small salary, the Board of Regents empowered a special committee "to find and employ a competent person for the
position of civil engineering at a salary not exceeding three thousand dollars. After much correspondence and investigation John J. Skinner of the University of Minnesota was elected. Unfortunately because of "his acceptance, his declination, his reacceptance and the full force of his vacillation and at last of his final refusal," the position made vacant by Professor Philbrick's resignation remained unfilled at the opening of the school year. After reporting to the Board of Regents, the difficulties that had been encountered in securing a competent professor for civil engineering the committee recommended that Orville D. Wheeler, Ph. B., be employed to aid Assistant Professor Magowan until a professor was secured. Acting upon this recommendation Mr. Wheeler was employed and placed in charge of instruction in land surveying. After the Board of Regents meeting adjourned, Committee Chairman, D. N. Richardson renewed the effort to secure a competent professor. Through correspondence with the heads of several eastern engineering schools, he contacted a number of professional men who were interested in becoming candidates for the engineering professorship at the University. Promptly Mr. Richardson arranged to hold interviews in New York, Springfield, and Boston. Of the candidates interviewed Charles D. Jameson of New York seemed most fitted
for the position and after Mr. Richardson had communicated with other members of the committee and Governor Larrabee, Mr. Jameson was employed. He assumed his duties on November 1, 1887, at a salary of three thousand dollars per year.

Since his graduation from Bowdoin College, in 1876, Professor Jameson had been employed as assistant engineer on the Memphis and Charleston Railroad, as division and resident engineer on the Mexican Central and he was in charge of Dredging on the Panama Canal. At the time he was elected professor of engineering at the University of Iowa, he was a member of the instructional staff at the Massachusetts Institute of Technology. Active and enthusiastic, possessing both executive and organizing ability, the advent of Professor Jameson to the University inaugurated an era of engineering development and expansion.

One of the first considerations to occupy Professor Jameson's attention was the engineering course of study, which together with others had been under consideration and discussion for almost two years. The reorganization of the Collegiate Department, in 1885, made some changes in the course of study almost imperative and the committee on the course of study therefore began at once to give the problem serious thought.
On February 21, 1887, the committee submitted a report to the collegiate faculty in which the following re-organization of the Science Department and the course of engineering was recommended:

First. That instead of presenting as now a single course in Science and one in Engineering, that we offer as follows:

1. A General Course in Science
2. A Course in Civil Engineering.
3. A Course in Mathematics
4. A Course in Astronomy
5. A Course in Zoology and Geology
6. A Course in Botany
7. A Course in Physics
8. A Course in Chemistry
9. A Course Preparatory to Medical Study.

These Courses to have the freshman year common and to diverge with the commencement of Sophomore year.

Second. We recommend that our requirements for the admission to the University be so changed as to include the Solid Geometry, and to omit all of the Algebra after Quadratics and that hereafter all students from "accepted schools" shall be examined in some one of the preparatory studies for which they bring certificates of proficiency before being admitted to the University.

Third. We recommend that the order of Mathematical Study in the Freshman year be modified in accordance with the proposed change in the conditions of admission so as to read: For Fall Term, Plane and Spherical Trigonometry; Winter Term, Algebra; Spring Term, Analytical Geometry of two dimensions.

Freshman Year
(Common to all Scientific Courses)

Fall Term. - Plane and Spherical Trigonometry,
German, Free-Hand Drawing.
Winter Term. - Algebra, German, Geometrical Drawing.

Spring Term. - Analytical Geometry of two dimensions, German, Botany.

COURSE IN ENGINEERING

Sophomore Year

Fall Term. - Physics, Analytical Geometry of three Dimensions, Land Surveying.

Winter Term. - Physics, Elementary Differential Calculus, Shades, Shadows and Perspective.

Spring Term. - Physics, 1st. Integral Calculus, Elective. Weekly exercises in English Composition.

Junior Year

Fall Term. - Analytical Mechanics, Descriptive Geometry and Stereotomy, Elective.


Senior Year

Fall Term. - Elective, Elective, Elective.

Winter Term. - Bridges and Roofs, Elective, Elective. 18

Spring Term. - Bridge Designing, Hydro-Mechanics, Thesis. 19

After being approved by the Collegiate Faculty, the course of study was referred to the Board of Regents for adoption. Because President Pickard and Professor Philbrick had tendered their resignations the Board of
Regents deemed it unwise to adopt such a major change at this time. In consequence, therefore, they passed a resolution on March 30, 1887, declaring that no action would be taken on the course of study until a new president was appointed. During the months which followed the Board of Regents' decision, the committee on the course of study continued to consider and discuss the problem in regard to course revision and on February 3, 1888, made a recommendation and again submitted an engineering course of study to the collegiate faculty for approval. It was recommended by the committee that:

After commencement 1891, the degree of C. E., not to be granted upon completion of an undergraduate course, but instead thereof a B. Sc.. After that date the degree of C. E. may be given upon the completion of one year's post graduate work in Engineering or to graduates in Engineering who have practiced the profession at least three years, and who have submitted an approved thesis and passed a satisfactory examination.

The recommendation in regard to the degree of Civil Engineering was promptly adopted by the collegiate faculty while the course of study submitted at the same time, did not receive approval until February 21, 1888. The course of study for engineering as referred to the Board of Regents after faculty approval was as follows:

Freshman Year

**Fall Term.** - Plane and Spherical Trigonometry.
German,
English.
Winter Term. - Algebra  
  German  
  English and Free-hand Drawing.

Spring Term. - Algebra  
  Analytic  
  German  
  English and Free-hand Drawing.

Sophomore Year

Fall Term. - Physics.  
  Analytic  
  Surveying and Draughting  
  French.

Winter Term. - Physics  
  Differential Calculus.  
  Geometrical and Map Drawing.  
  French  
  Roads, Streets, and Pavement.

Spring Term. - Physics.  
  Integral Calculus.  
  Plane Table and Stadia Work.  
  Contour Maps.  
  French.

Junior Year

Fall Term.  
  Chemistry.  
  Railway Location and Structural Drawing.  
  Lime, Cement, Concrete Mortars,  
  Frameways and Street Railways.

Winter Term.  
  Chemistry.  
  Advanced Mechanics.  
  Theory of Railway Location and  
  Elementary Designing.  
  Stereotomy.  
  Electric Motors and their Application.

Spring Term. - Applied Mechanics and Theory of  
  Strains.  
  Materials of Engineering Construction;  
  Strength and Resistance of Materials.  
  Metallurgy of Iron and Steel.
Senior Year

Fall Term. - Principles of construction.
    Selected Reading.
    Sanitary Engineering.
    Railway Construction and Management

Winter Term. - Roofs and Bridges.
    Thesis.
    Foundations.

Spring Term. - Bridge Designing.
    Thesis.

The studies in italics are elective.

With the adoption of the new course of study, by the Board of Regents, on March 7, 1888 a marked improvement was made in the provision for engineering instruction. The design of the whole course was to give the student a broad, solid foundation in mathematics, applied mechanics and the theory of engineering upon which he might, in after years, build up any branch of engineering desired. As much of the theoretical matter as possible was given a practical application in order to enable those finishing the course to be more thoroughly fitted to practice their profession. In accordance with this design the instruction given during the Freshman year to students taking the course of Civil engineering was the same as in the general scientific course with the exception of work in drawing which was required during the winter and spring terms. Although the extra work in drawing compelled engineering students to take four studies during two terms of their freshman year it was nevertheless
required in order that greater facility in the use of the
drawing instruments might be acquired and an aptitude for
drawing developed before the regular work in engineer-
ing began.

Instruction in surveying during the fall term
of the sophomore year, consisted of lectures, recita-
tions, and field practice. The first instruction con-
sisted of surveying without instruments simply by means
of pacing, and afterwards with a chain for measuring
distances within reasonable limits of exactitude. Once
the student had become thoroughly acquainted with
methods of surveying without the use of instruments he
was taught the use of the surveyor’s compass, solar com-
pass, wye level, and engineer’s transit. Frequently the
adjustment and use of these instruments were explained in
the class room but for the most part this phase of the
work and instruction was done in the field with the instru-
ments themselves. In the fall and spring terms alike,
engineering students worked in the field three afternoons
during the week and all day on Saturdays in order to ac-
quire a working familiarity with all the instruments in
use. The ground covered by their surveys in the field,
usually consisted of one or two sections carefully sur-
veyed after which section lines were run and topographical
survey made; the land all contoured, the important points
were fixed by triangulation. The parts of the sections most suitable were surveyed with the stadia, while other parts were surveyed by use of the plane table so that when the work was finished each student would have a complete set of notes in regard to the tract of land covered. From these notes maps were plotted, during the winter term, showing the boundaries of each piece of property, all the fence lines, the names of all the property owners, with the exact contour lines and all conventional signs showing the condition of the ground in different parts, that is, the kind of crops raised, meadow, or woodland. If woodland, the various kind of trees were indicated.

Through this work, instruction and practice in keeping field notes of work done was provided. In addition to the map drawing during the winter term, it was required that a number of geometrical problems be worked out and carefully finished, not only because of the practice they afforded in descriptive geometry but also because of the practice they gave in drafting. This geometrical drawing was merely a continuation of the drawing work done during the winter and spring terms in the freshman year.

The course upon Roads, Streets, and Pavements offered during the winter term, consisted of lectures on the location and construction of country roads and the best methods of maintaining them, the best cross sections
of streets, and a study of the different materials used for pavement, including wood, stone, brick, and asphalt. Students were required to take notes during all lectures in pencil and rewrite them as fully as possible, in ink, before the next lecture. Lecture notes were indexed and, together with a list of authorities upon the different subjects and a list of the different books from which important data could be drawn, they formed a rather complete book of reference upon each subject.

In the fall term of the junior year, structural drawing was commenced. At this time sketches of some railroad or highway bridge were made. Each part was carefully measured and the dimensions noted upon the sketches. From these notes taken in the field, a complete set of working drawings of each bridge was made. The object of this work was to improve the student in drafting and at the same time render him familiar with each part of a bridge and the general construction of bridges, before taking up the theory of bridge designing.

Because of the growing development of the railways and the railroad companies' appreciation of the need of maintaining a permanent corp of educated engineers particular attention was given to the subject of railroads in all its branches. Each year members of the junior class carried on a survey over ground that included as many of the problems encountered in railway location and building
as possible. Effort was made to have the work carried on as nearly as possible in the same manner as in actual railroad location. A reconnaissance of the whole section was made and from notes taken, the general line of the route was decided upon. A preliminary line without curves was then run through and after the levels were run over it, profiles were made and the general grade established. From the notes and plans thus far made the final location was determined in its general outline after which it was taken into the field and carefully fitted to the ground in detail. Simultaneously with this work, instruction was given in circular and transition curves and practice with them in the field.

Lectures upon limes, cements, concretes and mortars were also given during the fall term to all juniors. The lectures devoted primarily to the manufacture and use of concrete were followed by discussions upon the merits of natural and artificial cements. Each student of the class was required to make a series of briquettes for testing some one cement. The rules governing the making of these briquettes were very explicit in order that perfect uniformity in all tests might be realized. Students wishing to take the subject of cements as a thesis or do special research were provided with every facility possible. At this time, the cement testing
laboratory was one of the most complete of its kind, including testing machines, mixing tables, scales, balances, and properly constructed tanks for the immersion of about fifty thousand briquettes at one time.

During the fall term a course of lectures was also given upon Tramways and Street Railways, including horse railways, cable cars and the application of electricity to street railways.

During the winter term of the junior year, a course of lectures was given upon the "Advanced Theory of Railroad Location," including in detail economical questions that must be studied, the different problems that arise and the most economical methods of solving these problems. Every effort was made to have this course broad in scope and to include the most recent practices upon the American Railroad. During this term students began work in "Elementary Designing" which consisted of the designing of culverts of both wood and masonry and trestles. Throughout the term recitations in Applied Mechanics were held five days each week.

In the spring term of the junior year the course in Applied Mechanics was completed and the "Strength and Resistance of Materials" was taken up by lectures and recitation, together with the materials of engineering construction. Simultaneously with the work in "Applied Mechanics" and "Strength and Resistance of Materials"
students were expected to devote as much time as was possible in the testing laboratories, for original research and original deductions upon the questions that may come up for the testing of iron and steel and other materials of construction. Equipped with, a torsion testing machine, capable of testing up to three-fourths of an inch in diameter, an automatic register and a hundred thousand pound Riehle Testing Machine that tested directly for tension or compression and run by an engine, almost any amount of original research as well as most complete course of study and instruction was rendered possible.

In the fall term of the senior year, the Principles of construction and some of the details of Railroad Management, particularly the Road Department and the Department of Bridges and Buildings were studied by means of lectures and recitations. During this term seniors made visits to all accessible engineering works in process of construction in order to study the various steps as they occurred. In addition to the work indicated a course of lectures was given upon Sanitary Engineering, House Drainage, and Irrigation and other problems under each of these heads which have to be solved by engineers. The course in Designing of Roofs and Bridges was continued by work in the drafting room, by lectures and recitations. Lectures were also given upon such subjects as Foundations, Tunnelling, Rock Drills and Modern Explosives.
During the Spring term the Course in Bridge Designing was completed and a course in general Hydraulic Engineering was given. Up to this time the lack of equipment had made work in practical Hydraulics impossible. Plans were being made, however, to secure the necessary equipment and extend the work to practical Hydraulics. The course in Principles of Construction embraced analytical and graphical methods of determining the strains in all parts of bridges and roofs, of investigating the stability and strength of piers, abutments, arches, retaining walls and similar structures. The course of Bridges and Roofs consists of a detailed study of the different structures of this class with reference to economy of material, the proportioning of the parts and the designing of the details. For structures of this kind each student was required to make complete designs and working drawings with blue prints together with bills of material and an estimate of the cost.

Students were reminded in all instructions, not to lose sight of the fact that true engineering skill consisted not only in procuring a certain amount of strength in a given structure but doing so with a minimum expenditure of time, money, and material.

More comprehensive in its scope the engineering course, at this time, required a more varied and a greater amount of technical work than ever before. With an excellent "force of instruction" already provided it was the desire of Professor Jameson to procure equipment to
enable the "proper performance of the work in the department." He therefore submitted a request for equipment, the estimated cost of which was $10,503.00, to President Schaeffer. In making his request Professor Jameson wrote:

I have the honor to request that the State Legislature be petitioned to grant a special appropriation of sufficient amount to enable the Engineering Department to purchase at once all the articles on the enclosed list, in order that the work of that Department may be performed to the greatest advantage of the students and the State.

I hope that you will see the absolute necessity of procuring this amount of money for this purpose, and the utter impossibility of conducting the work of the Engineering Department in an entirely satisfactory manner without these necessary appliances.

Already the President had declared that it was the "Manifest duty of the state to adopt a more liberal policy toward the university." As the greater includes the less, so President Schaeffer perceived the University to be composed of several departments each of which must be developed and flourish in the greatness of the whole was to be maintained. In support of his demands that far greater generosity be shown to the university he declared that:

Those who are familiar with the history of the University cannot fail to observe the wonderful growth and development of the past twenty years. Twenty years ago, it is true, the number of students was nearly as great as to-day, but five-sixths of them were in the preparatory or normal departments, the number in the collegiate department being about one hundred. And even in the collegiate department the range of instruction, and the facilities for work, were extremely limited. But since those days the University in fact as well as in name, ... the scope of instruction in the collegiate department has been enlarged....every
thing has been done, so far as means would permit, to give the people of Iowa an educational institution of the highest rank. Is it any wonder then that the expenses have steadily increased? If the University had stood still in its condition of twenty years ago, it might easily be supported by the same outlay that was necessary in those times. I am sure the people of Iowa would have good reason to complain if the university had not grown with the times, that the expenditures have not grown out of proportion to the development of the institution may be seen by comparison with other similar large institutions. An investigation of this matter will show that the ratio of expense per student at the State University of Iowa is considerably below that of any other large university. Nor have the expenses of the university grown more rapidly than the state in population and wealth.

In order to supply the demands of the times in the way of more varied and more thorough instruction, the University has steadily adhered to the policy of spending as much as possible on those things which are absolutely necessary; providing competent teachers first and attending to the matter of equipment afterward. And since by the most careful management of the finances the money available has never been quite sufficient for the actual needs, it follows that in the matter of equipment the University is far behind the position which it ought to occupy.

In support of the argument that the duty and the obligation of providing buildings and equipment, for the university rests with the state, the President said:

It must be borne in mind that the University is an integral part of the state. The foundation and maintenance...being required by the terms of the Constitution, the dignity of the state demands that the institution should be such as is commensurate with the wealth of the state, and the needs of the people. It should be inferior to none in the country. It should be provided with all the necessary buildings; and in every way thoroughly equipped for the work that is expected of it.
President Schaeffer's request for a more generous and liberal policy toward the university brought renewed hopes and more funds for engineering. Reiterating the "request" of Professor Jameson, he reminded the Board of Regents that the "Amount of technical work required is now much greater and much more varied than was formerly the case." To meet the growing demands and to satisfy, in a measure, the higher educational interests of Iowa, represented in the University, the Regents included in their report to the General Assembly, a recommendation that ten thousand dollars be appropriated for additional engineering equipment. Governor Larrabee, too, in his message to the legislative body spoke of the university and declared:

Our university should be maintained on a higher plane, (than institutions supported by private contributions) and its income ought to be sufficient to warrant the employment of the best instructors in all departments. It matters little how this income is secured, whether by levy of a special tax or by a fixed appropriation; but, from whatever source derived, the income ought to be permanent. I do not know how a quarter of a million dollars could annually be expended to better advantage in this State than in the support of the State University. Additional buildings are needed;....Appropriations are also asked for additional equipment in the engineering department, and for other purposes.51

Although there were few members of the General Assembly opposed to higher education by the State or not desirous of seeing the University become the truly great institution its founders had intended, the needs of other institutions, and fear of the demagogues' cry of extra-
Vagance caused them to refuse the $225,000 appropriation requested and grant only $125,000. In regard to engineering although ten thousand dollars had been requested for equipment four thousand were appropriated. Even though greatly reduced the appropriation was not made without lively discussion. By some, the amount appropriated was considered too large and it was believed that the standing support fund, which had been given the university at its request, should relieve the state of such extraordinary appropriations. Quoting figures to show that the amount was excessive Senator Price moved to amend the bill by reducing the appropriation $50,000. The motion, however, was defeated by a vote of twenty-six to nineteen.

Upon hearing that four thousand dollars had "been appropriated through the generosity of the Legislature, for additional apparatus for the Course of Engineering" Professor Jameson in a report to President Schaeffer wrote:

I presume that, subject to the approval of the Board of Regents, this money (four thousand dollars) is available at the rate of Two Thousand Dollars for next year and Two Thousand Dollars for the year after; but in order to avail myself fully of the advantages connected with its use, I shall be under the necessity of spending more than the two thousand dollars this first year, for the following purposes.

To bring the Course of Engineering up to the standard of the best technical schools of this country, it is necessary that the Laboratory
for Tests and Experiments Upon the Strength of Materials of Engineering Construction be very much enlarged and improved, and in order to render this course of study complete, the following machines are necessary:

First, A 100,000 pound Testing Machine.
Second, An Engine Lathe.
Third, An Engine Planer.
Fourth, A Shaping Machine.
Fifth, A steam Engine to run these machines.

In regard to the testing machine, I have received the following proposition from Richle Brothers of Philadelphia, who make by far the best testing machines in the world. They have a new form of 100,000-pound Testing Machine which they are anxious to introduce in the West. The catalogue price of the machine is $28,000.00, but in order to give it a start here in the West, they are willing to furnish the University with one for exactly what it costs them on board the cars in Philadelphia, complete, or $1200.00. You can readily see the great discount which they give, and the University can scarcely afford to lose such an opportunity. Of course, to be available the opportunity must be taken up at once, as I do not presume their offer would stand beyond next July.

The other machines necessary for the preparation of specimens for testing, including the Planer, Lathe, and Shaper, will cost about $800.00.

For the running of these machines, a 10 horse-power engine will be necessary. This engine can be obtained from the Lansing Engine Works of Lansing, Michigan, for about $300.00, complete, they making a discount to the Department of 60 per cent on the regular price, in order to put the engine here as an advertisement.

This size engine would be large enough for the use of the Engineering Department, but in order to continue the instruction in Electricity and properly conduct the proposed Course in Electrical Engineering, there will be necessary an engine of the same size for the Department of Physics. The engine that has been thought of to serve for this purpose is a $1000.00 gas engine, 7 horse power,
the expense of running which would be something like $3.00 per day. Now if you should see fit to place in the basement of the Science Building a 25 horsepower steam engine, the cost of which will be about $750.00, it will furnish all the power I need for my Testing Laboratory, and also by means of a shaft running from the south-west corner of the Science Building to the basement of the Chapel Building, will furnish all the power necessary in the Physical Laboratories, and will supply all this power at a cost of less than $1.00 per day. The saving to the University will be some $700.00 in first cost, besides an reduction in the cost of operation. It is with full knowledge and approval of the Professor of Physics that I submit this proposition for your consideration.

In addition to these prices, it will cost about $200.00 freight on the machines, and setting them in place. This makes a total of $2500.00, provided a 10 horse-power engine is purchased; or $2900.00, provided a 25 horse-power engine is purchased. This I request permission to spend at once, subject in detail to the approval of the Executive Committee.

If permission is granted for these purchases to be made now, a saving to the University can be made of about $2000.00 on the total amount. That is, I can buy now for $2500.00 apparatus that at a later period might possibly cost some $4500.00 and would therefore be beyond the available means of the Department.

Communicated to the Board of Regents by the President the petition made by the Professor of Engineering was referred to the Executive Committee with power to act. Not sharing the same enthusiasm for engineering as Professor Jameson, and unwilling to subscribe to such a liberal policy, the Committee ordered that Engineer Jameson's application and all others looking to or asking to expend the new state appropriations before the same is received be
disallowed and that no one can be permitted to expend any of the fund until the Board makes the appropriation therefor in June next.

It is provided however that if Mr. Jameson can purchase anything desired in the line of his apparatus at cash rates payable in installment at the time designated in the legislative act he may do so but he must reserve enough to cover his running expenses in the engineering department as no more than $2000.00 will be allowed for each year in that department and only at the times the same becomes payable under the act of the Legislature.

Undismayed by the refusal of the Executive Committee to grant the request of Professor Jameson for equipment, President Schaeffer reported a second request of the Engineering Professor. "for machine tools and an engine and boiler, to cost one thousand dollars", to the Board of Regents, in June 1890. On this occasion the request was referred to the Committee on Library and Apparatus. This Committee in a report to the Board of Regents on June 18 recommended that "the Executive Committee be directed to purchase the engine as requested by Prof. C. D. Jameson."

The engine was secured and located in the northeast basement room of the science building. Originally constructed for an engine and machine room it had previously been assigned to the chair of engineering. In order that the engine might be utilized to greatest advantage the Executive Committee directed that it be placed in such a position that it could be used for both physical
and engineering purposes. This location was soon found to be unsatisfactory and President Schaeffer reported to the Board of Regents that it was "decidedly objectionable" to have the engine in the science building. At the same time he proposed that a "plain brick building to be used as a shop, and in which all of the machinery could be placed" be erected. He estimated that, "such a building could be put up for $12,000" and recommended that an appropriation for that purpose be made. The request was received favorably by the Board of Regents. In their report to the twenty-fourth general assembly, they emphasized the increasing demand for instruction in the various branches of engineering, called attention to the reasons for immediate action as set forth in the President's report and recommended that an appropriation of twelve thousand dollars for an "engineering building" and five thousand dollars for "engineering building equipment" be made. Convinced that the interests of the University demanded liberal appropriations the Board of Regents requested that $317,000 be appropriated for new buildings and the improvement of the various departments.

The bill for an act appropriating funds for the "better support of the University in the several departments and chairs" was referred to the committee on appropriations. The Committee after consideration of
the bill reported the same back to the senate and the house with a recommendation that it be indefinitely postponed and the accompanying substitute passed. In the substitute bill it was recommended that seventy eight thousand dollars be appropriated of which none was designated for engineering. The tardiness of action on the part of the Committee and the seeming indisposition to have the amount requested appropriated prompted President Schaeffer to go to Des Moines and invite the General Assembly "to visit the University" at their "earliest convenience." The invitation was promptly accepted by the House and a motion that the vote be reconsidered was lost. In the Senate, however, the invitation was rejected by a vote of thirty seven to nine. Without seeing for themselves the crowded conditions of the University and the great need for enlarged facilities not only in engineering, the substitute bill was passed. The amount of the appropriation was so much less than that requested that it precluded the possibility of erecting the new buildings "so much needed to carry on the work of the literary and the engineering courses." An editorial on the appropriation bill in the *Vidette-Reporter* is most enlightening.

The writer asserted that:

Everything that could possibly be done to show the legislators the needs of our institution was done, but they are still hampered by the lack of sympathy which exists between the University and the
people of the State, and by the extra demands made upon the State treasury by the Worlds Fair and the Soldier's Monument appropriation. The feeling toward the university is, however, growing better, and hopes of a large and sufficient appropriation from the next Legislature are entertained by all interested in the welfare of Iowa's grandest institution. 82

In his report the following year President Schaeffer reiterated his request that a building, suitable for a shop, and laboratories sufficiently equipped for the instruction of students in civil and electrical engineering, 83 be provided. The Board of Regents, however in making their recommendation to the twenty-fifth General Assembly requested only $2,500 for engineering and that for equipment. In the report of the committee on appropriations, to whom the bill on appropriations for the "better support" 85 of the University was referred, the amount designated for engineering was five hundred dollars. This amount although in keeping perhaps with the total appropriation 87 of seventy five thousand dollars was not in keeping with the report of a visiting committee appointed to "investigate and report as to the repairs, changes or improvements that maybe asked by the board." The committee after making the investigation, reported the buildings of the University in the "greater part" to be inadequate and "in the case of some departments, wholly unfit for the purposes for which they are of necessity used." "Limitations" they declared, "imposed by
legislative action have seriously circumscribed the opportunities of the institution." In concluding their report the Committee declared, "For the various departments we favor a liberal equipment. The support fund should be generous as possible."

Although the President of the University had requested a liberal appropriation for engineering and the Board of Regents had endorsed in a measure his request the law makers passed the appropriation bill without opposition in so far as engineering was concerned. With the exception of some discussion in regard to the method of beginning construction of the dental building and homeopathic hospital in advance of the time at which the appropriation became available all "features of the bill were without opposition."

The failure of the Assembly to make provision for a building to house the shops and engineering laboratories brought a communication from the scientific professors. In a letter of protest to the Board of Regents against the maintenance of shops for mechanical purposes and the running of the steam engine in the basement of the Science Hall, they declared,

The engine in the basement of the science building is to us the source of unceasing annoyance. During the time it is in motion no work with the finer microscopes can be done on the second floor and none with any microscopes on the third. Besides the soot
and dirt from the engine room and sometimes, the smoke permeates the whole house and makes it impossible to keep our collections clean. In addition to this our valuable collections are constantly endangered by the smoke in the basement. It is needless to say that our collections in many ways are unique and could not be replaced. 93

It had been understood that as soon as the natural sciences needed the entire science building, other quarters would be provided for the work in engineering. In the fall of 1894 this provision became necessary. After considerable discussion the plans to remodel the Old Observatory for engineering work were abandoned as impractical and the Executive Committee directed that the engineering department should be moved to the old dental rooms in South Hall. The Committee further directed that all be done "that maybe proper in the way of fixing the rooms for occupancy at a cost not to exceed $50.00."

Although only a small part of the engineering machinery was moved from the science building in 1895, to the basement and first floor of South Hall a deplorable lack of room was evidenced. Commenting on the lack of room the **Vidette-Reporter** stated that:

The Engineering Department when established in the old Dental quarters, found itself without a lecture room. In looking about the only available room to be had was the inner of the girls waiting rooms. This was promptly appropriated and the locked door announced the fact to the girls. 101
The crowded conditions continued to exist and adequate space was not provided until 1905. At this time, the new engineering building provided for by the appropriation of fifty thousand dollars was occupied.

Engineering expansion and development during the years that Professor Jameson headed the department of engineering consisted of more than merely legislative appropriations, and the occupation of more room space made necessary by the increased number of students. From the beginning the Professor sought to extend the opportunity for engineering education as well as to expand and develop the scope of engineering instruction.

Both unique and progressive was the establishment at the University of the first "Night School", in 1890, by Professor Jameson. Associated with the department of engineering the purpose of the "School" was to provide instruction in Elementary Mechanics and Mechanical Drafting to such mechanics and other persons, who, because of their work were unable to avail themselves of the regular university course. Although the new "School" was a legitimate feature of the University Extension the only requirements for enrollment were: "first, the impossibility of taking this course in the University; secondly, the intention of doing all the work possible; thirdly, punctuality and regularity in attendance." Students of the high school or academy were
allowed to enroll, since eventually they could attend the University.

The classes met on each Wednesday and Saturday night from seven until ten o'clock. Attendance at sixty hours of class in drafting and fifteen hours of lecture were required in order to complete the course. Professor Jameson announced that the lectures would consist of the elements of graphical calculation of strains in roof trusses, the use of iron, steel, stone, cement and wood in ordinary construction and the designing of the interior of dwelling houses for convenience and economy. The popularity of the "School" exceeded even the most sanguine expectations. Accommodations were provided for a class of twenty nine but on the opening night fourteen students were obliged to defer commencement of their work until further provision could be made. Accommodations and drawing tables were provided for a class of fifty when the class convened the second time.

During the second year of the "Night Schools" existence those students having attended previously were assigned to advanced work. Typical of the advanced courses was that of carpentry in which each member of the class was expected to make a complete set of plans with details for a dwelling house. Requirements demanded that ability to write specifications, and give a bill of material with an estimate of the cost be demonstrated.
Because the course was free of tuition and matriculation fee the only expenses incurred by students was the money expended for drawing instruments and other necessary materials.

The success of the Night School undoubtedly was a contributing factor in the establishment of a "School of Applied Mechanies and Architecture" in 1894. Contrary to the report of the Collegiate Department, in which the faculty declared, "We do not recognize the matter of establishing a new Chair of Architecture," the Board of Regents, on July 13, 1894,

Resolved: That the Executive Committee, the Professor of Engineering and the President of the University be directed to establish a school of architecture if practicable in the Engineering department — provided the same shall not cause any additional expense to the University — and the Professor of Engineering to receive no additional compensation for his services.

At a meeting of the Executive Committee later, in June 1894, the resolution adopted by the Board of Regents, on June 13, was discussed, and the organization of a "School of Applied Mechanics and Architecture" in connection with the Chair of Engineering approved. At the same time, the secretary was directed to have circulars printed and mailed to such persons and places as were deemed advisable or advantageous in fostering the interests of the new school.

The object of the School of Applied Mechanics
and Architecture, as stated in the circular published in 1894 was,

to offer to Mechanics, carpenters and others an opportunity of acquiring a thorough and systematic knowledge of the proper methods of use of materials of construction, Wood, Stones, Brick, Iron, Steele, etc., the designing of Machines, Trusses and Buildings, and the fundamental principles of architecture.

The whole idea of the course of instruction is to impart to the student as much knowledge, as the length of time will allow, upon such subjects as will be of immediate practical value.

No attempt is made to touch upon the advance theories of the subjects taught.

All who complete the course will be good draughtsmen and mathematicians and be able to solve readily any of the ordinary problems that occur in the designing of machines and buildings.

Because much of the instruction consisted of personal work with the individual students and the work required made to conform with mental ability and previous training or preparation academic requirements for admission to the new "School" were practically nonexistent. It was stated that: "Anyone of mature years who can read and write the English language and has a fair knowledge of arithmetic will be admitted."

In order to have a greater part of the school year during the winter months when there was less work being carried on outside the first term opened on October 17, 1894. Divided into two terms of thirteen
weeks each the school year closed on April 22, 1895. During the two periods an intensified schedule was maintained. Instruction was given five days each week the only exception being Christmas and New Years. All laboratories and draughting rooms were kept open on Saturday for the benefit of students desiring to do special work.

Unlike the "Night School" tuition in the School of Applied Mechanics and Architecture was charged at the rate of forty dollars per student for the two terms of twenty six weeks. Of this amount twenty five dollars was the fixed rate for the first term and fifteen for the second, "provided the full tuition for the first term had been paid."

The course of study set-up and announced in the "Annual Announcement" of the School, for the year 1894-1895 was as follows:

FIRST YEAR
FIRST TERM

Arithmetic - Algebra
Draughting
Problems, Pencil; Problems; Ink; Lettering;
Plans; Elevations.

Sections, Development of Surfaces. Projections.
Isometric Perspective. Cabinet Perspective.

Lectures

Materials of Construction and Testing Laboratories.
SECOND TERM

Interior Arrangement
Plans and Elevations
Sections, Details.
Working Drawings.

SECOND YEAR

FIRST TERM

Applied Mechanics
Graphical Statistics
Theory of Strains in Frame Structures.
Principles of Construction
Truss Designing.

Lectures.

Heating and Ventilation
Hot Air, Steam, Hot Water.
Sanitary Plumbing.
Bills of Material.

SECOND TERM

Designing Hotels, Churches, and Public Buildings.

Lectures.

Interior Decorations.
History of Architecture.
Modern Architecture.

No records are available to show how many students took advantage of the opportunities offered by the new school or that it ever actually functioned. The impression made or the influence exerted was certainly neither deep nor lasting since men closely associated with the department at that time or shortly after do not recall its existence.
Very probably it never functioned because of Professor Jameson's resignations, in 1896, and the disinclination of his successor, Professor Sims, to administer such a school.

The instructional expansion commenced by the adoption of the new and much broader course of study in 1888 was advanced following the manifestation of legislative generosity in 1890. By this special appropriation, the purchase of necessary apparatus for practical hydraulic experiments was made possible. Almost at once, it was announced that the course in Hydraulic Engineering would henceforth include theoretical hydraulics with its practical applications, water power, foundations, coast and harbor works, and practice in gauging rivers. Attention was also given to the sources and supply of water, its flow in natural and artificial channels, and in regard to irrigation, to the methods of collecting, storing, filtering, raising and distributing water for domestic purposes, with the practical details for carrying out such work. The impetus given to hydraulic engineering at this time was but a prelude to greater development that was to come during the first four decades of the twentieth century in the colleges of Applied Science and Engineering.

The expansion of engineering instruction in 1890, did not stop with hydraulic engineering. At the same time it was extended to include instruction in
electrical engineering. By the introduction of this branch and the enrichment of the engineering curriculum, generally, the University gave promise of extending its usefulness into a new and important field in order to satisfy a want for sometime keenly felt by the youth of Iowa and adjoining states. Never before was the demand for competent and thorough electrical engineers greater and no where was the demand greater than in the west, a region void of facilities for training professional and technical workers in electrical engineering.

Introduced at the University of Iowa, instruction in electrical engineering came as a result of a conference between Professor A. A. Veblen, D. N. Richardson, Chairman of the Board of Regents' executive committee and President Charles A. Schaeffer. After a thorough consideration of the questions it was decided at this conference that Professor Veblen might offer a course in Electrical Engineering provided that he would not, at once, ask for an additional instructor in the department of Physics. Following this decision the matter was referred to a faculty committee, composed of Professors Veblen, Jamieson and Andrews. This committee was instructed to consider and prepare to report on the advisability of the establishment and the contents of a course of study in electrical engineering. On December 5, 1890, the committee reported back to the faculty.
In the report the Committee recommended that a course in electrical engineering be established and submitted a draft of the proposed course of study. A four Year Course leading to the degree of Bachelor of Science in Electrical Engineering it provided for the following courses:

FRESHMAN YEAR

Fall Term. - Mathematics
German
English

Winter Term. - Mathematics
German
English
Drawing

Spring Term. - Mathematics
German
Drawing

SOPHOMORE YEAR

Fall Term. - Mathematics
Physics
German
Draughting, 2/5

Winter Term. - Mathematics
Physics
Draughting

JUNIOR YEAR

Fall Term. - Physics (Lectures, 1/5
(Laboratory, 1/5
Chemistry
Anal. Mechanics
Shop work, 2/5

Winter Term. - Physics (Lectures, 1/5
(Laboratory, 4/5
Chemistry.
Applied Mechanics.
Shop Work, 2/5

Spring Term. - Physics (Dynamics and Motors).
Chemistry
3/5 materials of Construction
Thermodynamics 2/5
Shop-work, 2/5

SENIOR YEAR

Fall Term. - French
Theory of Electricity.
Photometry
Electrical Laboratory
Steam Engine, Gas motors,
Water motors.

Winter Term. - French
Theory of Electricity.
Transformers, El. Lab. Thesis or
Special Work
Machine Designing.

Spring Term. - Prim. and Sec. cells
Telegraph and Telephone
Distribution of El., El. Lab.
Thesis or special work. 130

Approved by the collegiate faculty on December 12, 1890,
the Committee report was referred to the Board of Regents
for final adoption. Following its adoption, on March
11, 1891, the course of study was announced in the
University Catalogue. Students registered for the course
as freshmen in September of the same year. Both the
general and special work in electrical engineering were
carried forward under the direction and instruction of
the Physics Department with Professor Veblen in charge
until after the appointment of Dr. Ray T. Wells, in
1903.
Candidates for admission to the course in electrical engineering were obliged to meet the requirements for the general scientific course. Although classified as students of Electrical Engineering their work during the freshman year was identical with the corresponding year of the course in Civil Engineering. During the Sophomore Year in addition to the mathematics and draughting three terms of physics was required.

Analytical and applied mechanics made up the mathematical studies of the fall and winter terms of the Junior Year. A course in physics taken during this year was essentially practical work in the laboratory designed particularly to developing facility in the use of electrical apparatus. Lectures during the Junior Year were given once each week on such subjects as the construction and use of measuring instruments and the meaning and determination of units and constants. New subjects studied this year were Materials of Construction and Thermodynamics.

The electrical work of the Senior Year consisted partly of lectures on the theory of electricity and on the telephone, telegraph, transformers, and other apparatus, as well as on the distribution of electricity especially in lighting and railway work.

In general, the work of the electrical engineering course was intended to include a study of all available forms and varieties of electrical apparatus and
construction. Visits were made to plants and installations that were accessible and students were urged to acquaint themselves with the arrangement of electrical machinery.

The physical laboratory which occupied the basement and ground floor of the North building was adequately equipped to meet the needs of the course in electrical engineering. In the basement was a large engine and dynamo room, battery room, photometer room, and two large rooms used partly as shops and partly as laboratories. On the ground floor were the instructor's offices, the lecture room, and a large general laboratory, three special laboratories for heat, light and magnetism, and a large room used as a reading room and general electrical laboratory. In addition to the general physical apparatus, and the full line of electrical instruments of precision, such as galvanometers, bridges and resistance boxes, etc., there was a seven horse power gas engine, six dynamos and motors of from one half to six horse power, a storage battery of considerable capacity, lamps, transformer and meters, in the laboratory. There was also a first class lathe, with other metal and wood working tools.

Although Electrical Engineering was the only branch of engineering for which a course of study was adopted during the administration of Professor Jameson
instruction in other branches was given. Either by the introduction of new courses or expansion of those already offered. Sanitary and Municipal, Hydraulic, and Mechanical Engineering came to occupy important positions in the realm of engineering instruction.

The growth of cities and towns during the thirty years following the Civil War gave great impetus to the importance of Sanitary and Municipal engineering. That engineers might be trained, at least in part, for such essential work the committee made provision for Sanitary and Municipal Engineering in the course of study proposed and adopted, in 1889. As outline the work consisted principally of a study of sewers and sewerage and the cleaning of cities and towns. Limited in its scope instruction in this branch was not sufficiently expanded to enable or permit specialization until after the turn of the century.

The founding of the American Society of Mechanical Engineers, in 1880 accentuated the distinction between the two specialized fields of Civil and Mechanical Engineering. This distinction, however, did not cause Professor Jameson to establish a department of Mechanical Engineering. On the contrary he sought to offer courses in Steam and Gas Engines, and Machine Design in order to make the course in Civil Engineering more efficient and
practical. In a communication to President Schaeffer on April 25, 1890, after requesting engineering machines, Professor Jameson wrote:

There is a point of which I wish to call particular attention in regard to these machines. It is not my intention or desire to render the Course in Civil Engineering in any way a course in Mechanical Engineering. I have neither the facilities for instruction nor instructors capable of teaching such branches. These machines which I ask permission to buy are absolutely necessary for the simple course in Civil Engineering to enable the student to properly study the Strength and Resistance of Materials of Engineering construction. They are machines that are in use in every first-class engineering school in the country and without them it is impossible for us to compete with the schools at Ann Arbor, some of the schools in Illinois, and the schools in the east, in the teaching of Civil Engineering. 147

What promised to be a period of engineering development and growth, in 1890 culminated in a lag and depression during which the advances of the earlier years were almost lost and which, in a measure, may explain the resignation of Professor Jameson, in 1895. Despite the generous appropriation, and the growing sympathy throughout the State for the University, in the opening year of the century's last decade, enrollment very soon began to decrease and further appropriation bills were disallowed. The consequences of an era of over speculation and expansion were swiftly moving to a dramatic climax which was reached in 1893. In almost merciless fashion the crisis gripped the nation. Opportunities for railway engineers all but
ceased to exist as milage of railway construction which had increased from 5,400 miles to 8,384.59 miles in the decade of the eighties increased only 954.22 miles in the decade that followed. Equally tragic and ruinous to engineering development were the Iowa commercial failures the percentages of which were 0.50, 0.52, 0.48, 0.64 for the four years 1891 to 1894. The amount of liabilities involved in Iowa failures in 1893 was $11,452,932 more than the amounts of other years, and although the amount of deposits in Iowa State and Savings banks on June 30, 1893 exceeded forty two million dollars it was almost one third of a million below the amount for the corresponding date, in 1892. Agriculture too, did not escape the consequences of the economic crisis. With products "increasing faster than population" Iowa farmers were unable to escape and it was said, in 1891, "that more farms in Illinois, Iowa and Wisconsin have been deserted by their owners than have been in New Hampshire, Vermont and Massachusetts." The tenants constituted 29.57 percent of Iowa’s 205,435 farm families and farmers "occupying encumbered farms in their own name made up an additional 37.53 percent" in 1890. In the same year it was estimated that 47 percent of the taxed land in the state was under mortgage which consequently meant an especially burdensome fixed charge of interest. Under the pressure of continued declining agricultural prices
and increasing property taxation, which raised from eleven
million dollars, in 1881 to fifteen million dollars, in
1889, rural dissatisfaction and anger grew. Angered
by corporation pressure, an unreliable press, and the
deafness of political parties to their pleas Iowans di-
rected their efforts through political channels and forced
the legislators to heed their cry and reduce appropriations.

With engineering suffering badly from the de-
pression and prospects for a rapid recovery apparently
not in view Professor Jameson submitted his resignation,
to become effective, in June 1895.

To succeed Professor Jameson the Board of
Regents, on June 12, 1895, elected Alfred Varley Sims.
Following the work of the engineering profession after
his graduation from the University of Pennsylvania,
Professor Sims, brought with him both scholarship and
practical experience to the chair of engineering. Almost
at once, he organized anew and instilled new enthusiasm
in the work of engineering. Recovery from the economic
crisis was already apparent but many of the wounds it
inflicted were as yet unhealed and consequently delayed
the opportune time to request an appropriation for
engineering. With characteristic sound judgment Professor
Sims withheld requests for his department until the end
of the first year and then merely asked that it "be
allowed to cost as much for two or three years as it had
cost during the most economical years of my predecessor,"
- five thousand dollars a year. He further requested
that three salaries be paid from the amount and that one
thousand dollars be spent for equipment and expenses in-
curred in the operation of the department. Impressed by
the reasonableness of his request the Board of Regents
made the appropriation for the year. Of the sum
appropriated Professor Sims managed to save five hundred
dollars which he expected to use after the next appropri-
ation for the Hydraulic Laboratory. The fulfillment of
his hopes were delayed, however, when the Board of Regents
in the appropriation made the following year allowed only
seven hundred dollars for engineering equipment and
operating costs of the department. This apparent
reduction, was, in reality, a diverting of funds in as
much as the balance was used for the printing and publica-
tion of an Announcement of the Civil Engineering Department
which had been authorized by the Executive Committee on
April 30, 1896. The first real attempt to advertise
the department the "Announcement" was illustrated by the
building which housed engineering, and scenes from the
drawing rooms and testing laboratory "and" contained a
detailed description of the Course in Civil Engineering.
The "Announcement" was widely circulated and the increased
enrollment showed in September, indicated it was worth-

With the number of students registering for
engineering courses greater than ever before and the earlier faculty opposition to the course practically non-existent, the promise of future development seemed assured. The brightness of the future development, not only of engineering, but of the whole University was temporarily darkened, however, by the sudden death of President Schaeffer. Herein was a loss that struck students, faculty, and regents with sorrow and alarm. And rightly so for

Assuming the burden of the presidency at a time when the powers of the University were paralyzed by factions in its faculties and dissensions among its supporters, President Schaeffer had succeeded in quieting all quarrels, harmonizing all factions and bringing the university to a pitch of prosperity beyond any which it had hitherto enjoyed. 165
Chapter IV

EXPANSION AND DISCORD, 1899-1904

In the emergency created by the death of President Schaeffer, the Board of Regents placed the administration of the university in charge of Amos N. Currier, Dean of the Collegiate Faculty, until a successor might be chosen.

Because members of the Board of Regents were of the opinion that the future success of the University depended upon their ability to find the proper man for the position, they consulted and conferred by letter and in States. A special committee elected by the Board of Regents was sent to meet and interview those persons who seemed most likely suited for the university needs. On June 7, 1899 after the committee's investigation was completed and a number of candidates for the position had appeared before the Regents, George E. MacLean, at the time, President of the University of Nebraska, was unanimously chosen President of the University of Iowa. In a report on the newly-appointed President the Regents stated

We feel that President MacLean's character, education and experience justify our conviction that we have found in him the very best man whom the nation affords for our particular needs. He is in the prime of life, a refined, cultured, Christian gentleman; a pleasing and effective public speaker; a thoroughly educated and enthusiastic scholar; an administrator of proved ability, and a man who will be a positive moral force in the university. We have no doubt that if the University of Iowa is given the same financial support which the University of Nebraska
has been given by the state, during the period of his labors there, we shall make even greater progress under his efficient and progressive administration than did the institution whose presidency he resigned to accept his present position. 5

The esteem in which President MacLean held the University and his desire to continue the educational policy of his predecessor was expressed in his first report to the Board of Regents. In this regard, he wrote:

The worth of the university has not been proclaimed. The careful economy with which it has been administered, practically to the point of distress, during the biennium just closed, is well known to all. The fidelity and ability of the faculties, the earnestness of the students, the success and prominence of the alumni, vouch for the goodness of the institution. The report of the regents, in which I heartily concur indicates what is needed for the immediate future. 6

Because he had not entered upon the presidency until August, 1899, President MacLean included the recommendations made by President Schaeffer for the first year of the biennium and by acting president Dean Currier. While the report of President Schaeffer deplored the failure of the Twenty-seventh General Assembly to make the requested appropriation and urged greater generosity toward the University by providing money for the "engineering laboratories, 7" the Currier report specifically declared that "Civil and electrical engineering need substantial strengthening and development." 8
The recommendations of both in regard to engineering was in keeping with the sentiment and desire expressed by the collegiate faculty. To foster interest and further its development the faculty recommended on June 9, 1899 "that $200 be appropriated for a Fellow in Civil Engineering and $500 for engineering supplies."

On December 10, 1900, the same faculty adopted a report, submitted by the Science Committee in which it was declared that:

Whereas: it is of vital importance to the other departments of Physical Science, particularly to Physics, Mathematics, Chemistry and Geology, as it affords practical application of these sciences and a stimulus to advance work which could not exist without it, and

Whereas, a duty is owed to the Alumni of the Engineering Courses in the maintenance and proper development of said courses, and

Whereas the Engineering cannot now be maintained with the same expenditure estimated to the President and Board of Regents in May 1900, - therefore be it

Resolved 1. That an expenditure of at least $10,000 in the early future in development is a necessity and is hereby recommended.

Resolved 2. That the attention of the Regents should again be earnestly solicited to the condition of these departments.

After reading the faculty resolutions the Board of Regents summoned Professors MacBride, Weld, and Sims in order to discuss the needs and advantages of larger engineering equipment and the advisability of greater engineer-
The discussion was completed, on December 21, 1900, and without further delay the Board of Regents adopted a resolution:

That it is the sense of the Board that the Engineering Department should be especially encouraged and that in the near future it should receive such financial assistance as the finances of the University will permit.13

This resolution was published in the University of Iowa News Bulletin and sincere expressions of approval were immediately heard from all parts of the state and additional students made application for admission. Further development seemed doubtful, however, following a fire on March 10, 1901, which caused an estimated loss of between $150,000 and $200,000 damage. Starting supposedly from spontaneous combustion in the chemical room of the medical building the fire spread to South Hall and soon destroyed that building, which since 1895 had housed the "school of engineering." Aided by students and town volunteers the fire department was able to save all of the furniture and apparatus of the engineering department. Losses other than the building were those sustained by Professor Sims, in the form of private equipment and books, estimated at two hundred dollars. Professor Magowan was reported to have lost books and papers valued at fifty dollars. The real loss to engineering was South Hall and although

Classes were held as usual on Monday morning, rooms for those dispossessed departments being made in the dental building, the homeopathic medical building, Science Hall and Close Hall, the home of the University Christian Association, 19
the arrangement was most unsatisfactory. The Board of Regents were not dismayed by the great loss not contemplated when the resolution was passed. Appeal was promptly made to the State Executive Council for an appropriation from the Providential Emergency Fund and fifteen thousand dollars was received. From this appropriation expenditure was made for the construction of a temporary medical building and a building for the "school of engineering." With the smaller portion of the appropriation being allowed for engineering the work of construction was entrusted to the Engineering Department. Under the direction of Professor Sims the work was prosecuted in such an earnest manner by engineering students that in fifteen days a new building - "the shed" was completed and "the Engineering Department was again 'at home' - not beneath the roof as of yore, but resting upon the same foundation."

The first floor of "the shed" contained 4,700 square feet, divided into library and reading room, two offices, blue print and dark rooms, recitation rooms and instrument cases; two large well lighted drawing rooms the combined capacity of which was sufficient to accommodate sixty drawing tables. The ground or basement floor contained 4,300 square feet for laboratory purposes. In it was established a demonstrating hydraulic laboratory, cement laboratory, testing laboratory, wood working and
model room and a large machine room, 14 feet by 104 feet. The alacrity and success which characterized the efforts expended in providing the new "home" for engineering prompted President MacLean to report that,

The expeditious completion in fifteen days of the temporary hall of engineering under the energetic direction of Professor Sims, leaves the work of his department not very unimpaired, but with a better outlook than before the fire.27

That engineering instruction might be made more complete it was determined at the beginning of the school year, in 1901, that more stress should be placed upon shop and laboratory practice. The engineering machinery left in the basement of the Science Building and that belonging to the Civil Engineering Department, but used in the Physics Department was removed to the engineering building commonly known as "Shed". Sufficient room for the machinery was provided by removing the brick partition walls in the basement of the engineering shed, supporting the floor above by wooden columns and converting the whole basement into one large room that was quite well suited to the purposes of a shop. Bricks from the partitions were sold to meet the expenses of the change which was made by the engineering students under the supervision of Professor Sims. 28

The installation of the shop equipment was begun under the direction of Edward Robenaw, who had been in charge of the department's shop work during the greater
part of the period when it was carried on in the Science Building. On November 20, 1901, however Samuel E. Schaff was employed and assigned to look after further installation of shop equipment. After he completed the installation of both old and new machinery, Mr. Schaff put in place the equipment of the hydraulic laboratory.

While engineering machinery was being moved and located the committee on the course of study were not unmindful of their duty. Early, in 1902, therefore, this committee began to consider the engineering course with a view to making desirable changes. On February 21, 1902, Professor Sims, on behalf of the committee, submitted a course in civil engineering which he recommended for use beginning the following September. This course together with one in electrical engineering submitted by the committee was adopted by the faculty of the College of Liberal Arts on February 28 of the same year.

The courses of study reported to the faculty were as follows:

CIVIL ENGINEERING

FRESHMAN YEAR

First Semester.

German or French ---------------5 hours
Mathematics ------------------4 hours
Physics ------------------------2 hours
Drawing ----------------------2 hours
Second Semester.

German or French ———— 5 hours.
Mathematics ———— 4 hours.
Physics ———— 4 hours
Drawing ———— 2 hours.

SOPHOMORE YEAR

First Semester.

English (Fresh.) ———— 2 hours
Mathematics ———— 4 hours
Surveying and Mapping ———— 5 hours
Chemistry ———— 4 hours
Geology ———— 2 hours.

Second Semester

English (Fresh.) ———— 2 hours
Mathematics ———— 4 hours
Top. Surv. and Descript.
Geom. ———— 4 hours
Limes and Cements ———— 2 hours
Geology ———— 2 hours
Shop Work ———— 2 hours.

JUNIOR YEAR

First Semester

English (Soph.) ———— 3 hours
Physics ———— 4 or 2 hours
Analyt. and Appl’d. Mech.———— 4 hours
Graphics ———— 3 hours
Theory of Stresses ———— 3 hours
Shop ———— 2 hours.

Second Semester

English (Soph.) ———— 3 hours
Physics ———— 4 or 3 hours
Analyt. and Appl’d. Mech.———— 3 hours
Graphics ———— 4 hours
Theory of Stresses ———— 3 hours
(Shop)? ———— (1) hour.
SENIOR YEAR

First Semester

Ry Curves and Earthwork -------2 hours
Steam Engine-------------------2 hours
Sanitary Engineering----------2 hours
Designing---------------------4 hours
Civil Engineering-------------3 hours
Laboratory---------------------2 hours
Specifications and contents--2 hours

Second Semester

Resist of Materials-------------2 hours
Hydraulics---------------------3 hours
Water Supply--------------------2 hours
Designing---------------------3 hours
Civil Engineering-------------3 hours
Laboratory---------------------2 hours
Eng. Society or Thesis--------33

ELECTRICAL ENGINEERING

FRESHMAN YEAR

German or French--------------5 hours
Mathematics-------------------4 hours
Physics-----------------------4 hours
English-----------------------2 hours
Shop work, elective-----------1 hour
Military-----------------------3 hours

SOPHOMORE YEAR

French or German---------------5 hours
Mathematics-------------------4 hours
Physics-----------------------3 hours
Drawing------------------------2 hours
Shopwork----------------------2 hours
Military-----------------------3 hours

JUNIOR YEAR

Chemistry----------------------4 hours
Physics------------------------4 hours
Mathematics ------------------ 4 hours
English------------------------ 3 hours
Seminary---------------------- 1 hour

SENIOR YEAR

Draughting------------------- 3 hours
Mathematics, one Semester;
Chemistry, one Semester-- 2 hours
Steam Engine and Resistance of
Materials------------------- 2 hours
Physics---------------------- 8 hours.

NOTE: One year of German and one of French are required. Either may be taken during the Freshman year, to be succeeded by the other in the Sophomore year.

The courses of study in civil and electrical engineering having been approved by the faculty the committee continued their study in regard to the need for further engineering development and course expansion.

Since 1892 courses in Mining Engineering, and Mining and Metallurgy had been offered in connection with the department of Geology. With Professor Samuel Calvin at the head of the department the courses outlined at that time were both comprehensive and thorough, including at once, both liberal and purely technical subjects. The great demand for mining engineers, after the turn of the century, prompted the committee to prepare, and, on March 27, 1902, submit a course of study in "Mining Engineering" and in "Mining and Metallurgy," to the faculty for approval.

The courses as approved by the faculty were as follows:
MINING ENGINEERING

FRESHMAN YEAR

First Semester
French or German—5 hours.
Mathematics, (a, b) — 4 hours.
Physics, 1 — 4 hours.
Drawing—2 hours.

Second Semester
French or German—5 hours.
Mathematics 2(a) and 2(b) — 4 hours.
Physics, 2 — 4 hours.
Drawing—2 hours.

SOPHOMORE YEAR

First Semester
Freshman English—2 hours
Mathematics 3(a, b) — 4 hours
Chemistry — 4 hours
Physics, 5 (lectures) — 2 hours
Surveying and Mapping—5 hours

Second Semester
Freshman English—2 hours
Mathematics, 6 — 4 hours
Chemistry, 2 — 4 hours
Physics, 6 and 3 — 4 hours
Shop work — 2 hours

JUNIOR YEAR

First Semester
Sophomore English—3 hours
Analytical and Applied Mechanics—4 hours
Qualitative Analysis —2 hours
Determinative Mineralogy—2 hours
Geology—4 hours.
Second Semester

Sophomore English----------3 hours
Analytical and Applied Mechanics----------3 hours
Qualitative Analysis 6a, 6b----------4 hours
Geology, 5----------4 hours
Shop Work----------2 hours

SENIOR YEAR

First Semester

Steam Engine----------2 hours
Theory of Stresses----------2 hours
Practical Mining----------4 hours
Geology 6----------4 hours
Elective----------4 hours

Second Semester

Resistance of Materials----------2 hours
Hydraulics----------3 hours
Practical Mining----------4 hours
Geology, 6----------4 hours
Elective----------4 hours 38

MINING AND METALLURGY

FRESHMAN YEAR

First Semester

English or Drawing----------2 hours
French or German----------5 hours
Mathematics, 2(a) and 2(b)----------4 hours
Physics, 2----------4 hours

SOPHOMORE YEAR

First Semester

Sophomore English----------3 hours
French or German----------3 hours
Chemistry, 1----------4 hours
Geology, 3----------4 hours
Drawing or Freshman English----------2 hours
Second Semester

Sophomore English------------3 hours
French or German ------------3 hours
Chemistry, 2 ----------------4 hours
Geology, 4 -----------------4 hours
Drawing or Freshman English--2 hours

JUNIOR YEAR

First Semester

Geology, 2 ------------------- 4 hours
Physics, 3 --------------------- 3 hours
Qualitative Analysis, 3 ------- 2 hours
Determinative Mineralogy, 15-- 1 hour
Quantitative Analysis, 5a ---- 1 hour
Elective from Mathematics
and Engineering-------------  5 hours

Second Semester

Geology, 5 ------------------- 4 hours
Physics, 4 ---------------------- 3 hours
Quantitative Analysis, 6a, 6b-- 3 hours
Determinative Mineralogy, 15-- 1 hour
Elective from mathematics
and Engineering-------------  5 hours.

SENIOR YEAR

First Semester

Geology ---------------------- 4 hours
Electro-chemistry and Electro-
metallurgy, laboratory
course, 9 ------------------ 2 hours
Quantitative Analysis
applied to Mining,
Laboratory course, 5b, --- 2 hours
Physics, 5 lectures--------- 2 hours
Shop work -----------------  2 hours
Elective-------------------  4 hours
Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geology</td>
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<tr>
<td>Electro-chemistry and Electro mettallurgy</td>
<td></td>
</tr>
<tr>
<td>Laboratory course</td>
<td>2</td>
</tr>
<tr>
<td>Metallurgical Assaying, laboratory course</td>
<td>2</td>
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<tr>
<td>Physics, 6, and Laboratory work</td>
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<tr>
<td>Shop work</td>
<td>2</td>
</tr>
<tr>
<td>Elective</td>
<td>4</td>
</tr>
</tbody>
</table>

The four courses of study approved by the faculty were adopted by the Board of Regents on April 25, 1902. At the same time, the Regents declared that hereafter, "the group of studies relating to Mining and Mining Engineering" should "be considered as a department of Mining and Mining Engineering."

Encouraged by this action of the Regents the Committee on Science adopted a memorial, on May 12, and directed that a copy be presented to the President of the University, and each member of the Board of Regents. Recalling the memorial of December 10, 1900 the Committee declared:

Whereas the faculty of the College of Liberal Arts has already caused representations to be made to the Board of Regents relative to the development of applied science and the departments of engineering, and

Whereas, such representations resulted in the unanimous passage of a resolution by the Board of Regents to the effect that such development "should be especially encouraged, and that in the near future should receive such financial assistance as the finances of the University would permit," and
Whereas, all the reasons then obtaining are of even greater force now; therefore be it

Resolved, that we, the Committee on Science of the faculty of the College of Liberal Arts, respectfully request the Board of Regents, through the President, to again give the matter their serious attention, and

Resolved, that it is the sense of this Committee that it is especially desirable, if not essential, that the development contemplated in this direction during the present biennium should be inaugurated immediately, and

Resolved, that in the development of the departments of engineering the immediate needs would be but meagerly met by the creation of an Instructorship in Mining Engineering, and a Professorship in Mechanical and Electrical Engineering, and

Resolved, that, since space equally as suitable for the Military Department and that now occupied is available, in our opinion the plan originally proposed of devoting the West Building to the contemplated development of Engineering should be carried out, especially as during the coming year the Department of Physics will need fully twice the space it has hitherto required. This condition is occasioned by the fact that recent changes in the Science courses have doubled the work in Physics. Furthermore it is probable that the equipment which can be provided for the work in Electrical Engineering will be limited, in which case the electrical apparatus belonging to the laboratory in Physics will for a few years have to be used in common by the two departments, and

Resolved, that we request the secretary to forward copies of the above preambles and resolutions to the President for the transmission to each member of the Board of Regents, and that the President be requested to offer our best services, individually or collectively, to the Board of Regents in the accomplishment of the ends herein mentioned.
The proclamations gave an impetus to the Board of Regents determination that Engineering should be encouraged. In their June meeting, therefore the Regents appropriated one thousand dollars for an instructor in engineering and another thousand dollars for apparatus to equip a "School of Electrical and Mining Engineering" and directed that the school be established in the Armory, the lower floor of which was almost immediately remodeled and equipped as a laboratory. Provision was made for dark rooms for photometry and photography, a large storage battery room, an instrument room and a large main room for use in experimental work. The efforts of the Regents to "encourage engineering" in a greater measure were evidenced on July 22, by the adoption of a resolution providing that two thousand dollars "be appropriated for Electrical, Mining, and Mechanical Engineering, the same to be expended for instruction and apparatus as shall seem best by the Executive Committee."

The action taken by the Board of Regents made possible the development of higher professional engineering. Already engineering at the University of Iowa was on the march offering definite advantages over similar schools. Advantages well expressed by President MacLean in a letter under date of February 21, 1903. Writing to Mr. J. W. Downey at Fort Collins Colorado, he declared:

The advantages of our civil engineering course are that it is upon a thorough univer-
sity basis. We maintain high standards of admission and our degree is worth more than the degree of many other institutions with lower standards, but with a larger number of students. Second: The number in our civil Engineering courses in proportion to the staff giving instruction, is small, with the result that there is more personal attention given to a student. It is still further true that we are able to place every graduate of this course; indeed they are picked up before they come to graduation. The standing of our graduates is such that these outgoing students are much sought for, and they have powerful friends at court for them. Another advantage we have is, that the civil engineering courses are conducted in the midst of the University with seven different colleges, and as part of the college of liberal arts. This gives the University spirit as compared with being a merely technical school. Owing to the fire of two years ago we have not showy buildings, but we have a good deal of new apparatus.

The enthusiasm for engineering development, the appropriation of funds to foster its expansion and the greater advantages offered in the two years following 1900 were without precedent and little less than phenomenal. So great was the growth that the Board of Regents appointed a "Special Committee on the School of Applied Science" and on April 9, 1903 adopted the following committee report.

Resolved, that we establish the school of applied sciences in connection with the college of Liberal Arts;

That there be a director of this school, and that Lasnas G. Weld be hereby appointed Director;

And further that the said Director report to this Board a plan in detail for such school at the June meeting of the Board.
On June 16, Professor Weld appeared before the Regents and made his report, giving a plan for the organization of a School of Applied Science. The report made by the Professor was on motion of Regent Babb referred to the special committee of which Regent Wright was chairman and to which the Governor appointed Regents Babb and Lane. The following report was made and adopted by the Board of Regents, on June 17.

We recommend that the suggestion made by the Director, in connection with the acceptance of the proposition of Mr. and Mrs. Euclid Sanders, in connection with the concession of the dam, be referred to the Executive Committee with instructions to investigate and report at the next meeting of the Board.

Second, that a Professorship in electrical and mechanical engineering be established, but for the present the person in charge of that work be an assistant professor and that there be appropriated $500 for the purpose of purchasing apparatus for use within that chair.

We recommend that we establish a chair of municipal and sanitary engineering, and the appointment of Assistant Professor Magowan to that chair, also as professor in charge of drawing in connection with the civil engineering department, without increase of stipend.

We recommend, that Ass't. Prof. A. G. Smith be appointed Professor of Mechanics in the department of Mathematics, without increase in stipend.

We recommend, that the Executive Committee investigate the question of additional drafting room for the use of the chair of civil engineering, and for municipal and sanitary engineering, but suggest that they fit up the upper floor of what is known as the West Building for that purpose.

We approve the recommendation of the Director in his suggestions to invite George H. Bremner,
W. D. Lovell, and Arthur J. Cox, to lecture before the engineering departments, the University to pay only their actual expenses.

We also recommend that the Director of the School of Applied Science be authorized to invite such other engineering experts as he shall deem necessary to lecture before that department, the University to pay only their actual expenses.

We recommend that authority be given the Director to issue a special post-commencement announcement of the School of Applied Science, in an edition of 1500 copies and the expense of the same to be paid from the appropriation for printing and publication.

The establishment of the School of Applied Science by the Board of Regents was most significant. By this action they virtually pledged their support of the work of science teaching and scientific investigation in the University. Although the school was concerned with "any and all those scientific subjects which have or may hereafter have application useful to man," Professor Weld almost from the beginning began to work for a strong engineering school. As a University school and not merely a school of technology or mechanic arts the Director sought to make the departments of pure science contribute immediately to the economic and practical education of University students, including those of engineering.

Characteristic of the prevailing spirit was that expressed by President MacLean. Writing to Professor Frank
A. Wilder, at the University of North Dakota, in regard to his appointment to a position at the University of Iowa, in the department of Mining, President MacLean, wrote under date of May 2, 1903:

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Without elaboration, the following points may be helpful to you at this time.

1. Governor Cummins, president of our board of regents, is an enthusiastic supporter of the University, and has declared his intention that its liberal support should be one of the features of his administration. We anticipate that he will lead the next legislature to greatly enlarge our support fund.

2. The past two legislatures have treated the University with fair liberality, and especially in contrast with the treatment of the preceding legislatures. Within three years the support fund of the University has been more than doubled, and extended, and is now yielding us perhaps $110,000 a year for buildings only.

3. For several years there has been deliberation as to the policy of the University with reference to developing other engineering work than civil, the department in existence here for years. The regents made provision a year ago for developing mining and electrical engineering. This year they have resolved to establish a school of applied science. They will coordinate and focus the work even in the pure sciences with reference to this school of applied sciences. All is to be upon the University level, the engineering departments will be fostered. This is a fortunate moment, therefore, in the history of the University, to come to the chair of which Professor Calvin has been writing you. I shall heartily concur with him and with Professor Weld, director of the school of applied sciences, in recommending your appointment, and I am confident the regents will enthusiastically make it if we can be sure that you will accept it. The $2100 salary, in my estimation, can be found for you the ensuing year. Professor Calvin is the authority to speak concerning what the Geological Survey will do over and above that.
4. You asked Professor Calvin about a school of mining. The establishment of the school of applied sciences is much wider in its scope than a school of engineering of any kind, but as the greater includes the less, the engineering will be cared for. At this moment, the chair is all that is wise to speak of, but if we have the growth anticipated, while this is not for publication, you can see that some day there will be a College of applied science, with schools of engineering of different kinds. We believe, however, in taking time for growth, and not in manufacturing things, particularly on paper.

On May 22, Mr. Wilder was elected to the chair of petrology and economic Geology and Mining at a salary of $2,100. Characteristic of the trend, was the appointment made on June 17, whereby Professor Magowan was placed in charge of Municipal and Sanitary Engineering and Drawing, and that of Dr. Roy T. Wells of Foxboro, Massachusetts, on August 22, as Assistant Professor, in charge of Electrical and Mechanical Engineering with an annual salary of twelve hundred dollars. The enthusiasm manifested by the President of the University and the Board of Regents toward a greater development of the School of Applied Science was evidenced by Mr. and Mrs. Euclid T. Sanders, who at this time, proposed to make a gift to the University of the dam and water power known as Terrill's Dam situated across the Iowa River between Lots 3 and 6, Section 3, Township 79, Range 6, West in Johnson County, Iowa, also the cribbing and such work at the west end of the said dam, and a strip of land situated at the west end of Lot 3, in said section 3 aforesaid lying between
the public highway known as Foster Road and
the bank of the Iowa River and extending
north 150 feet from the east end of said dam. 59

The real significance of the gift not being fully appreci­ated the proposal was referred by the Board of Regents,
to the Executive Committee for consideration and evalua­
tion. On August 26, the Committee voted to recommend
the acceptance of the gift. In the report to the Board
of Regents the Committee stated:

We believe that the said property can be
utilized by the University to great advantage
by the School of Applied Science in connection
with the Department of Engineering and in securing
power for the University in generating
electricity and for other purposes. It will
give us control of this dam in case we should
ever wish to make river improvements in front
of the University campus; that it will require
an appropriation of about $600. to make repairs
on said dam to restore it to a good condition.

We recommend that said gift be accepted
and the following resolution adopted.

Resolved, that the thanks of this Board be and
they are hereby extended to Mary A. Sanders and
Euclid Sanders for their generous gift to the
University.

Resolved, that an appropriation of $600 be
made to make the repairs on said dam, the same
to be under the direction of the Supt. of
Buildings and Grounds. 62

The recommendation of the executive committee
was adopted by the Regents on September 24, 1903.  "Much
concerned" about the water power grant and setting great
value upon the gift "in connection with proposed develop­
ments," Professor Weld contacted members of the Board
of Regents either personally or by correspondence and obtained their assurance that the gift would be accepted. With this assurance, on August 17, he recommended to the executive committee that "such attention be given Mr. and Mrs. Sander's grant of Terrill waterpower as may be necessary to put the matter in best possible condition." Consequently following the official acceptance of the gift, the Executive Committee authorized the Superintendent of Buildings and Grounds "to contract for repairs on the dam," however, "at a cost not to exceed $425.00.

In order that the School might be equal to other schools of Applied Science in the country President MacLean recommended that Professor Weld be authorized to visit and inspect some of the leading engineering schools. Acting on the President's recommendation, the Executive Committee allowed Professor Weld one hundred dollars for that purpose, the same to be taken from the President's traveling fund.

Leaving Iowa City, on July 27, 1903 Professor Weld, in addition to contacting many leading men in the engineering profession and "available for positions to be created in the course of further development," visited a large number of the leading technical schools in the country. Among those visited were, the Lewis Institute in Chicago, the Case School of Applied Science, in Cleveland, the Niagara Power Plant, the Worcester Polytechnic School and other technical schools in the vicinity of
At Bridgeport, he received many valuable suggestions relative to the development of the School of Applied Science, from Mr. Gilbert W. Goodridge, "Superintendent of the joint factory of the Bryant and the Parkins Electric Companies." Writing on August 2, from Boston to Mr. William J. McChesney, Secretary to the Board of Regents, Professor Weld stated that "My trip is proving very profitable. I shall have seen, upon my return, the leading technical schools of the country." After his return, to Iowa City, in a report to the executive committee he again expressed the fact that great profit had been derived from the tour of inspection.

The requirements for admission to the school of applied science were the same as those for the general scientific course, - substantially the completion of a four year high school course. The following preparatory credits, however, were required for the scientific courses:

- English ————6 credits
- Foreign Language———4 credits
- History and Civics ————2 credits
- Mathematics———5 credits
- Elective———3 credits

Students who presented thirty credits in acceptable preparatory subjects but who were deficient in required preparatory work were admitted as unclassified students and required to make up their deficiencies at once.

Almost the same, from the point of view of content and time required for their completion, as those
in eastern technical schools the courses of study announced for the various branches of engineering were as follows:

School of Applied Science 1904-1906

COURSE IN CIVIL ENGINEERING

FRESHMAN YEAR

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Second Semester</th>
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<tbody>
<tr>
<td>German or French 1 (2)</td>
<td>5 hours</td>
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<tr>
<td>Mathematics (First Year)</td>
<td>4 hours</td>
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<tr>
<td>Physics 1 (2)</td>
<td>4 hours</td>
</tr>
<tr>
<td>Drawing 1 (2)</td>
<td>2 hours</td>
</tr>
<tr>
<td>Surveying and Mapping 5</td>
<td>16 hours</td>
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<tr>
<td>Chemistry 1</td>
<td>4 hours</td>
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<tr>
<td>English 1 (2)</td>
<td>2 hours</td>
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<tr>
<td>Mathematics (Second Year)</td>
<td>4 hours</td>
</tr>
<tr>
<td>Geology 1 (2)</td>
<td>4 hours</td>
</tr>
<tr>
<td>Earthwork and Railway Curves 5</td>
<td>2 hours</td>
</tr>
<tr>
<td>Descriptive Geometry and Topographical Surveying 4a, b</td>
<td>2 hours</td>
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<tr>
<td>Shopwork 6</td>
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SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Second Semester</th>
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<tbody>
<tr>
<td>Surveying and Mapping 3</td>
<td>5 hours</td>
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<tr>
<td>Chemistry 1</td>
<td>4 hours</td>
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<tr>
<td>English 1 (2)</td>
<td>2 hours</td>
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<tr>
<td>Mathematics (Second Year)</td>
<td>4 hours</td>
</tr>
<tr>
<td>Geology 1 (2)</td>
<td>2 hours</td>
</tr>
<tr>
<td>Earthwork and Railway Curves 5</td>
<td>4 hours</td>
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<tr>
<td>Descriptive Geometry and Topographical Surveying 4a, b</td>
<td>2 hours</td>
</tr>
<tr>
<td>Shopwork 6</td>
<td>17 hours</td>
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JUNIOR YEAR

<table>
<thead>
<tr>
<th>First Semester</th>
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<tbody>
<tr>
<td>Electrical Engineering</td>
<td>3 hours</td>
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<tr>
<td>Shopwork 7</td>
<td>2 hours</td>
</tr>
<tr>
<td>English 21 (22)</td>
<td>3 hours</td>
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<tr>
<td>Mechanics 75 (76)</td>
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<tr>
<td>Graphics 9 (10)</td>
<td>4 hours</td>
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<tr>
<td>Stresses 11 (12)</td>
<td>2 hours</td>
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<tr>
<td>Engineering Jurisprudence</td>
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<td>17 hours</td>
<td>16 hours</td>
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### SENIOR YEAR

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<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
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<tbody>
<tr>
<td>Limes and Cements 13</td>
<td>2 hours</td>
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<tr>
<td>Economics</td>
<td>2 hours</td>
<td></td>
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<tr>
<td>Steam Engine 107</td>
<td>3 hours</td>
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<td>Sanitary Engineering 17</td>
<td>2 hours</td>
<td></td>
</tr>
<tr>
<td>Designing 19 (20)</td>
<td>4 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Civil Engineering 21 (22)</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Laboratory 23 (24)</td>
<td>2 hours</td>
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</tr>
<tr>
<td>Water Supply 30</td>
<td>2 hours</td>
<td>3 hours</td>
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<tr>
<td>Hydraulics 28</td>
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<td>2 hours</td>
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<tr>
<td>Resistance of Materials 90</td>
<td></td>
<td>2 hours</td>
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<td>Engineering Society or Thesis</td>
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<td>2 hours</td>
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<tr>
<td></td>
<td>18 hours</td>
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### COURSE IN ELECTRICAL ENGINEERING

### FRESHMAN YEAR

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<tr>
<th>Course</th>
<th>First Year</th>
<th>Second Year</th>
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</thead>
<tbody>
<tr>
<td>German 1 (2) or French 1 (2)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Mathematics (First Year)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Physics 1 (2)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Mechanical Drawing 1 (2)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>English 1 (2)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td></td>
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<td>17 hours</td>
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### SOPHOMORE YEAR

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<th>First Year</th>
<th>Second Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics (Second Year)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Chemistry 1 (2)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Shopwork 7 (See Civil Engineering)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Machine Drawing</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>English 21</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Electricity and Magnetism (2)</td>
<td></td>
<td>2 hours</td>
</tr>
<tr>
<td></td>
<td>18 hours</td>
<td>17 hours</td>
</tr>
</tbody>
</table>

### JUNIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Year</th>
<th>Second Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanics 75 (76)</td>
<td>4 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Electricity (Fundamental principles and theory, and direct current machinery 5 (6))</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
</tbody>
</table>
## JUNIOR YEAR (CONT'D)

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical laboratory</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>(Elementary) 3 (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry (Quantitative analysis and physical Chemistry)</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>English 22</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Steam Engineering and Thermo-Dynamics 107</td>
<td>3 hours</td>
<td></td>
</tr>
<tr>
<td>Hydraulics 28</td>
<td>2 hours</td>
<td>1 hour</td>
</tr>
<tr>
<td>Machine Design and Mechanism</td>
<td>2 hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>17 hours</strong></td>
<td><strong>18 hours</strong></td>
</tr>
</tbody>
</table>

## SENIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political Economy and Engineering Jurisprudence</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Advanced Electrical Laboratory 11(12)</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Theory and Application of Alternating Currents 9(10)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Thesis 13(14)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Elective</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td></td>
<td><strong>16 hours</strong></td>
<td><strong>16 hours</strong></td>
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</tbody>
</table>
COURSE IN MECHANICAL ENGINEERING

The first two years are the same as in electrical engineering

JUNIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanics 75(76)</td>
<td>4 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Electricity 5(6)</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Electrical Laboratory 3</td>
<td>2 hours</td>
<td></td>
</tr>
<tr>
<td>English 22</td>
<td></td>
<td>3 hours</td>
</tr>
<tr>
<td>Chemistry (Quantitative and Fuel Analysis)</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Mechanical Engineering 101 (102)</td>
<td>3 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Mechanical Laboratory</td>
<td>2 hours</td>
<td>1 hour</td>
</tr>
<tr>
<td>Machine Design and Mechanism</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17 hours</td>
<td>18 hours</td>
</tr>
</tbody>
</table>

SENIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political Economy and Engineering Jurisprudence</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Theory and Application of Prime Movers 109 (110)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Thermo-Dynamic and Hydraulic Laboratory 111(112)</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Thesis 113 (114)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Elective</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td></td>
<td>16 hours</td>
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</table>

COURSE IN MUNICIPAL AND SANITARY ENGINEERING

FRESHMAN YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>German 1(2), or French 1(2)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Mathematics (First Year)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Physics 1(2)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Drawing 1(2)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>English 1(2)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td></td>
<td>17 hours</td>
<td>17 hours</td>
</tr>
</tbody>
</table>
### SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics (Second Year)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Chemistry 1 (2)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Surveying, Mapping and Lettering, 3</td>
<td>5 hours</td>
<td></td>
</tr>
<tr>
<td>Descriptive Geometry and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topographical Surveying 4a,b</td>
<td></td>
<td>4 hours</td>
</tr>
<tr>
<td>Earthwork and Railway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curves 5</td>
<td>2 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>English 21 (22)</td>
<td>3 hours</td>
<td>3 hours</td>
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</tbody>
</table>

**Total:** 16 hours 17 hours

### JUNIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanics 75 (76)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Graphics 9 (10)</td>
<td>2 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Theory of Stresses 11 (12)</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Chemistry 21 (22)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Electrical Engineering 7</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Hydraulics 28</td>
<td></td>
<td>2 hours</td>
</tr>
<tr>
<td>Economics</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total:** 18 hours 18 hours

### SENIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limes and Cements 13</td>
<td>2 hours</td>
<td></td>
</tr>
<tr>
<td>Steam Engineering and Thermo-Dynamics 107</td>
<td>3 hours</td>
<td></td>
</tr>
<tr>
<td>Sewerage and Sanitation 17</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Engineering Jurisprudence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural Designing 19</td>
<td>3 hours</td>
<td></td>
</tr>
<tr>
<td>General Biology 1 (2)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Bacteriology 21 (22)</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Roads and Pavements (42)</td>
<td></td>
<td>2 hours</td>
</tr>
<tr>
<td>Water Supply and Engineering 30</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Resistance of Materials 90</td>
<td>2 hours</td>
<td></td>
</tr>
<tr>
<td>Sanitary inspection, design and construction 52</td>
<td></td>
<td>3 hours</td>
</tr>
<tr>
<td>Elective (Geology 1 (2) recommended)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Thesis</td>
<td>2 hours</td>
<td>2 hours</td>
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</tbody>
</table>

**Total:** 17 hours 18 hours
# Course in Mining Engineering

## Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign Language</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Mathematics (First Year)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Physics 1(2)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Chemistry 1(2)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Mechanical Drawing 1(2)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td></td>
<td><strong>17 hours</strong></td>
<td><strong>17 hours</strong></td>
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</tbody>
</table>

## Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 1(2)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Mathematics (Second Year)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Geology 1(2)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Quantitative Analysis 3(4)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Physical Measurements 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surveying 3</td>
<td>4 hours</td>
<td></td>
</tr>
<tr>
<td>Mine and Topographical Surveying, 4 b</td>
<td></td>
<td>2 hours</td>
</tr>
<tr>
<td>Drawing</td>
<td>2 hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>18 hours</strong></td>
<td><strong>18 hours</strong></td>
</tr>
</tbody>
</table>

## Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanics 75 (76)</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Mineralogy 31 (32)</td>
<td>4 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Metallurgy 30</td>
<td></td>
<td>4 hours</td>
</tr>
<tr>
<td>Electrical Engineering 7</td>
<td>3 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Electrical Laboratory 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theory of Stresses I</td>
<td>3 hours</td>
<td></td>
</tr>
<tr>
<td>Shopwork 7</td>
<td>2 hours</td>
<td></td>
</tr>
<tr>
<td>Hydraulics 28</td>
<td></td>
<td>3 hours</td>
</tr>
<tr>
<td>Briquetting 42</td>
<td></td>
<td>1 hour</td>
</tr>
<tr>
<td>Political Economy and Engineering Jurisprudence</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td></td>
<td><strong>18 hours</strong></td>
<td><strong>18 hours</strong></td>
</tr>
</tbody>
</table>
## SENIOR YEAR

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining Engineering:</td>
<td></td>
</tr>
<tr>
<td>Excavation and tunnelling, design of mine plant, etc. 39</td>
<td>5 hours</td>
</tr>
<tr>
<td>Timbering, ventilating, mine administration, etc. 40</td>
<td>5 hours</td>
</tr>
<tr>
<td>Ore Dressing 35</td>
<td>2 hours 3 hours</td>
</tr>
<tr>
<td>Petrology II</td>
<td>2 hours 2 hours</td>
</tr>
<tr>
<td>Assaying 26</td>
<td>2 hours 2 hours</td>
</tr>
<tr>
<td>Electro-Chemistry 8</td>
<td>3 hours</td>
</tr>
<tr>
<td>Metallurgy 27(28)</td>
<td>2 hours 2 hours</td>
</tr>
<tr>
<td>Steam Engine 107</td>
<td>2 hours</td>
</tr>
<tr>
<td>Elective</td>
<td>2 hours 2 hours</td>
</tr>
<tr>
<td>Thesis</td>
<td>2 hours 2 hours</td>
</tr>
<tr>
<td><strong>18 hours</strong></td>
<td><strong>18 hours</strong></td>
</tr>
</tbody>
</table>

Summer field work, after sophomore and junior year, six weeks, each.

The courses of study in the school of applied science, the entrance requirements and the teaching staff, headed by Professors Sims, Magowan, and Wells made the engineering department at the University of Iowa comparable with that of eastern universities. The greatest need, at this time, was a new building to house the department of civil engineering and for such improvement Professor Sims, in particular, was ambitious. He wanted a fifty thousand dollar building.
and he was ready to direct his energy and effort. Nor was President MacLean lacking in enthusiasm as he reported to the Board of Regents, that,

On the whole, the work in the civil engineering department has materially improved during the present year. The practical work afforded by the construction of the large bridge adjacent to the city, which has been under our direction, has been of great value to the Senior and Junior classes. It is not impossible that even more important work of like practical nature will be undertaken in the not distant future.

Less than three months later he supplemented his laudatory remarks by saying that

The demand for our graduates and even our underclassmen continues to be most gratifying. Of the seniors so far placed the average compensation is $750 per year. The remaining too have declined positions at $720 per year.... In this connection, my mention that so far as time has permitted I have extended the employment bureau for our engineering alumni and have been able to advance quite a number to better positions.

Cognizant of the fact, that not only engineering but the University as a whole had reached a stage of flowering, that might easily be blighted by false economy, the Board of Regents reported to the Thirteenth General Assembly that

If conditions had been such that the Twenty-ninth General Assembly could have provided adequately for the fire loss, by supplying the $200,000 asked instead of the $85,000,
the three buildings would now be completed, fully equipped, and ready for use.

A close estimate shows that it will require nearly if not all of the remaining $115,000 to properly house what was housed by the fire of March 10, 1901.

The great need for new buildings was most apparent to the Board of Regents and questions arose only in regard to which "must wait on the other." In view of the facts and considerations the Regents decided, in September 1903, to renew their "appeal for a special appropriation of the remaining $115,000," to rehabilitate the medical college....and to push forward other buildings long since needed." In an enumeration of "other buildings" considered of immediate necessity it was declared that "Provision ought to be made also for housing the work in applied science. All work in engineering is now in the unsightly and unfit shed erected over the foundation of old South Hall."

Included therefore, in the requisition of funds for the support of the University, which totaled $360,000, was $115,000 for the construction and equipment of buildings "to make good the fire loss" and $25,000 for the construction of the dam, and the erection of a hydraulic power plant.
To provide the requested funds for the support of the University, and consequently engineering, Representative Koontz and Senator Hughes introduced bills in the legislature on February 19, 1904.

After the second reading of the bill it was referred by both the Senate and the House to the Committee on Appropriations, which requested, that before making any recommendation, a joint committee be appointed to investigate and report on "the system and management and affairs at the State educational institutions."

The Committee appointed to visit the State University was composed of Senator Maytag and Representatives Jones and Weeks. Following their investigation the opinion of the committee in regard to engineering was divided. Senator Maytag and Representative Jones signed the majority report which recommended that:

For the engineering department... no building should be erected and that the department should be discontinued entirely, for the reason that we have at Ames, one of the finest engineering halls in the country and we believe that all expenditures in this line should be concentrated in one place.

In regard to an appropriation for the construction of the dam it was stated in the same report that:

We cannot recommend an appropriation for this purpose. It is not a necessity, and the benefits that the University and its students would derive would not justify an expenditure for that purpose.
Unwilling to subscribe to the majority report Representative Weeks submitted a report in which he opposed the disestablishment of engineering, recommended ninety thousand dollars for the "construction and equipment of buildings to make good the fire loss of March 10, 1901," and five thousand dollars for the dam.

By the two conflicting reports the crisis of 1904 was precipitated, and for several weeks the fate of the engineering department seemed to hang in the balance, waiting for the legislature to act. Finally, on April 2, 1904, the Committee on Appropriations introduced a bill into the House for an act appropriating $208,000 for the State University of Iowa. Of this amount it was designated that fifty thousand dollars should be used for an "engineering building" and ten thousand dollars for the "dam and water power." An attempt was made by Representative Head to have the bill amended by striking out the appropriation for engineering and the dam, and appropriate only $1,500 for the "engineering department" but his effort was expended in vain, the House refusing to adopt the amendment and voting unanimously to pass the bill. Received by the Senate, on April 7, the bill was referred to the Committee on Appropriations after the
second reading. Because this committee was opposed to the $208,000 appropriation and desired to pare the amount designated for engineering a conference of the members of the senate and house committees on appropriations was held, on April 8, in an effort to reach a satisfactory adjustment of affairs. The efforts, however, of the joint conference were futile. The house members definitely refused to alter their recommendation and the senate members were unalterably opposed to the appropriation they proposed. The firm stand taken by both committees gave indication that the fight would be carried to the senate where already a sentiment to approve the action of the house was beginning to grow.

The report of the committee was made through its chairman, Senator Garst, on April 11, and recommended a reduction of the appropriation from $208,000 to $148,000, of which fifty thousand dollars should be used for an engineering building and water power. Almost immediately after the report was made, Senator Garst moved that "the rule be suspended and this be considered the third reading." The motion of the Senator prevailed. The vote which followed sent the recommendation of the committee down in defeat and gave senate approval to the house bill by a majority
of forty one to one. It was a tremendous victory for engineering and Professor Sims and all friends of the University.

With fifty thousand dollars appropriated for a new building and ten thousand dollars for the dam, the aim to make the department of engineering the best in the country seemed about to be realized. Such optimism was enhanced when the Board of Regents, on June 5, indicated their intention to give whole hearted support by adopting a resolution which directed that the following sums be appropriated for the school of applied sciences as recommended by the director, namely:

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Engineering</td>
<td>$3,750.00</td>
</tr>
<tr>
<td>Municipal and sanitary Engineering</td>
<td>1,000.00</td>
</tr>
<tr>
<td>Mining Engineering</td>
<td>1,500.00</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>3,750.00</td>
</tr>
<tr>
<td>Mechanics</td>
<td>300.00</td>
</tr>
<tr>
<td>Additional equipment in Chemistry</td>
<td>3.00</td>
</tr>
<tr>
<td>Additional equipment in Physics</td>
<td>300.00</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>150.00</td>
</tr>
</tbody>
</table>

The same to be distributed and expended by the executive committee.

Two days after the appropriation was made the Secretary to the Board of Regents, W. J. McChesney,
in a letter to Dean Weld, stated that the intention of the Regents in making the appropriation was to place the $11,050,00 in the hands of the Executive Committee for equipment for the various departments in the School of Applied Sciences, the amount to be distributed among the various departments as seemed best to the committee, the above schedule to be merely a guide for the committee and not an appropriation of a certain specified amount to each department.102

The jubilation occasioned among the University engineers and their friends was very shortly quieted and eclipsed by the Board of Regents' investigation of President MacLean, in order to stop the talk that was "going the rounds" of the press about divisions within the faculty and mismanagement of the university. The sentiment of the board was embodied in the following resolutions adopted, on June 13, 1904:

Whereas, There has come to the knowledge of the board of regents of the University, through the public print and the actions of certain associations of the alumni of the University, that there exists certain criticism of the management of the University, its president, and professors; and,

Whereas, It is the desire of the board of regents to secure the fullest information regarding such charges and criticism; and,

Whereas, That we desire that the students and alumni of the institution shall feel at liberty at all times to freely make to the board of regents any suggestions or criticism that they believe will inure to
the best interests of the university; therefore, be it

Resolved, That the board invites students, alumni, and all other parties who have information to furnish or charges to make regarding the management of the University, the president or professors, or the relation existing between the different departments of the University, to appear before the board and give the board all the information they may have in reference thereto, and the board will also use its best efforts to secure the presence of all persons who may appear to have any knowledge or information concerning the subject of this resolution; and that such hearing be commenced at 3 o'clock, P. M., June 14th, and continue until all parties shall have ample and full opportunity to be heard.

Because a copy of the resolutions was not sent to press representatives, in advance, the Board of Regents was both criticized and accused of being intent upon sustaining President MacLean. Despite the charge, however, that opportunity was denied alumni because there was "no time for action" a committee consisting of Milton Remley of Iowa City, W. D. Lovell and C. E. Clark, of Des Moines and William Powell of Cedar Rapids appeared before the board on the first afternoon, June 14, 1904. All spoke at considerable length against the President and made the specific charge that he was insincere in his dealings with the men with whom he was associated. The charge advanced was greatly weakened however, since they neither gave
proof, "nor did they make their charges from personal knowledge but from personal information the authority of which they were not at liberty to divulge."

The investigation was continued on the following day with faculty members being summoned to give testimony in regard to the charges made against the President. Even though the Board of Regents had agreed to the request of the Alumni Committee that, "should faculty members appear before them with information regarding this alleged lack of harmony", their statements be treated confidentially, the testimony of the faculty revealed little. For the most part conservative, evasive, and indefinite, perhaps from motives of self interest and because they felt the case predetermined, faculty statements justified the Board of Regents' declaration that:

Whereas, We have made an extended investigation of the University, regarding which we have had before us a large number of professors and alumni, and to which all persons having complaint, were invited to appear.

Resolved. That as a result of said investigation we find that there is no sufficient cause for any change in the presidency of the University.

On the day following the adoption of the resolution exonerating President Maclean of the charges alleged against him the Board of Regents gave the following
statement to the local press:

Whereas, During the present investigation, this Board has been informed that certain professors and instructors have from time to time during the past years improperly and unwarrantly criticized the president and attempted to undermine his influence as the administrative head of the institution, which has caused much of the dissension and divisions that apparently exist in the faculty: therefore,

Resolved, That we condemn such conduct on their part, believing that each professor and instructor while connected with the University should loyally support the institution, and assist in its upbuilding in all its departments and sustaining its officials; that complaints, if any, as to the administration or other acts of its officials, should be made to the Board and not on the street or elsewhere.

That if any professor or instructor is dissatisfied with the administration as to make such criticisms otherwise than to the Board he should sever his relations with the University. III

The investigation of President MacLean and the announcement of the Board of Regents' findings seemed remote to the department of engineering until at the very end it was announced that the resignation of Professor Sims and Professor Andrews had been requested. This action of the Board of Regents was a shock to both faculty and engineers. To the professors it was especially shocking since they had "no intimation that charges had been made against them."
Unlike the President, charged with inability to command respect, incompetency, and insincerity, Professor Sims had instilled an enthusiasm and loyalty in his students that was both deep and lasting, his work was considered as exceptionally good and he was under no charge so far as the public knew. In view of such contrast, the action of the Regents requesting his resignation was resented by many. By such persons the President was charged with having attributed, without justification, certain newspaper articles to the pen of Professor Sims, and of blaming the Professor for anti-MacLean activity by engineers throughout the state. They also charged the President with having allied himself with President Beardshear of Iowa State College and to him, sacrificed the work in engineering for work along the literary and classical lines. In accord with this it was said that he was opposed to the fifty thousand dollar appropriation for the engineering building and finally having been unable to kill engineering in the university it was "contended by friends of the department that the president has been taking vengeance by subjecting Professor Sims to humiliation."

Especially resentful regarding the Regents' action were some of the engineers as is evidenced by a movement among them to discontinue their work at the University.
Professor Sims, however, reported to a representative of the press, that he "had nothing to say for publication except the fact that he desired that none of his friends take action unfriendly to the University," and expressed the "intention of writing personal letters" to the engineering students in order to discourage and breakup the movement "to prevent any of the students from returning next fall."

In an attempt to answer criticism of the Board of Regents' action, Regent Wright on his return to Des Moines stated that:

The board of regents would have been recreant to its trust had it done otherwise. The insubordination which was displayed could not be contemned. Nothing was to be done except to relieve these gentlemen of their relations to institutions in as much as the charges against the president were not sustained.

I believe any jury of nine men in the world, selected in any conceivable way almost, could have reached no different conclusion than that reached by the regents if they had heard the same case.

That being true what was there for the board to do? It is fruitless discussion now. But I believe that the people will understand perfectly that the board was charged with the responsibility and a duty in the matter; and it was unanimous in its action.

The differences of opinion and the individual convictions as typified in President MacLean and Professor
Sims arose, perhaps, from their ideas of what constituted a "real university, undivided at Iowa City" and the degree of emphasis that should be placed upon the "humanities" and "sciences". Differences were accentuated by their disagreement concerning the order in which new university buildings should be erected, and such action of the President was interpreted as being indicative of the criteria of educational emphasis and not emergencies. To President MacLean, urgent necessity seemed to indicate that in the building program precedence, not however, to the exclusion of engineering, should be given to the museum, library, gymnasium and assembly hall. To Professor Sims, the need for the engineering building naturally was given first consideration and place. The Board of Regents declared its policy to sustain the President, and the faculty was required to conform. Qualities of character made conformity between the President and Professor Sims impossible. Consequently, for the restoration of unity and harmony, a new man to take the place of Professor was deemed imperative and to this end the resignation of Professor Sims was requested.

In accordance with the Board of Regents' request Professor A. V. Sims resigned his position in June, 1904, and re-entered the practice of his profession. For the position of head of the engineering department, now vacant, it was desired to secure a man with experience
both as an engineering practitioner and an educator, and at the same time one with organizing and executive ability. After personal interviews and correspondence the Executive Committee invited William Galt Raymond of Rensselaer Polytechnic Institute to become Professor of Civil Engineering.

A graduate of Washington University, St. Louis, Professor Raymond received the degree of Civil Engineering in 1884. After his graduation he joined the instructional staff at the University of California, and in 1892 he accepted the professorship of Geodesy, Road Engineering and Topographical Drawing in the Rensselaer Polytechnic Institute, Troy, New York, which position he left to accept the professorship at the University of Iowa. In addition to his experience as an educator, Professor Raymond brought to Iowa practical engineering experience. For eleven years he was consulting engineer for the city of Troy's new water supply, designing and in part completing the system. He was chief engineer for the building of the Troy and New England Railway.

Eminently qualified for the position, his final acceptance was given only after a definite memorandum under date of August 19, 1904 was confirmed by President MacLean. Herein he declared:

I understand that I have agreed to go to service in the State University of Iowa with the following understanding:
The immediate position to be Professor of Civil Engineering;

The ultimate position, to be assumed as soon as practicable, and certainly within the first year, to be Director of the School of Applied Science;

The salary to be $3,600 per annum;

A chair of Steam Engineering to be immediately created and properly filled with a full professor;

An instructor in drawing to be at once secured;

For the engineering departments a policy of wisely rapid development in accordance with the modern demands to be followed by the University authorities.

Confirmation of the memorandum was given by the President, almost at once, and together with the agreement, reported to the Board of Regents, on September 22, 1904. Approved and adopted on the same day it ushered in a year of intense and vital activity which culminated with the recommendation by Professor Raymond and President MacLean, and its adoption by the Board of Regents, "that the title of the School of Applied Science be changed to the College of Applied Science."
Chapter V

THREATS TO EXISTENCE 1904, 1912, 1939

The forces of the "always active opposition" against which engineering at the University had struggled since its earliest years converged shortly after the turn of the century in an effort to have the department dis-established at Iowa's first institution and concentrated at the College of Agriculture and Mechanic Arts. This attempt, the first of three, was in a general way the culmination and expression of that prevailing popular misconception regarding the work of the State University and the College of Agriculture and Mechanic Arts or their relative importance in the educational interests of the state. Critical, therefore, from the viewpoint of Iowa educational interests and engineering education at the State University were the years 1904, 1912 and 1939. Each year an attempt was made to effect a removal of engineering from the University to the State College of Agriculture and Mechanic Arts and each time the effort was overwhelmingly defeated.

Addressing the members of the Thirtieth General Assembly Governor Cummings after paying tribute to the economy of administration at the State University and the Iowa State College of Agriculture and Mechanic Arts urged
the need of greater financial support. As if to rebuke the legislators for their parsimony of the past he declared:

The appropriations made for them have been expended with painstaking economy and a stern effort to make them cover wants; the like of which I have rarely seen. I have advised both these Boards to lay before you the needs of their respective institutions without regard to the probability of your being able to supply them at this time. I have no sympathy nor indeed tolerance for the attitude sometimes assumed, of appearing before you, asking something and fearing lest too much should be asked. I have said to them and I now repeat to you that these institutions belong to the State of Iowa, and these Boards are simply trustees to manage them as best they may; and it is their duty to report to you their exact condition and all their needs, and it is for you to supply them if you can.

We may well be proud of the instructional force at both of these institutions. It is superb, and its strength and loyalty keep the University and the College in the front notwithstanding the meagerness of compensation, the inadequacy of numbers and the incompleteness of equipment. We can well boast, also of the student bodies, for in every thing that makes up the promise of superior manhood and womanhood, they are unsurpassed. It is however, true that both of them must have more support or they will fall behind in the race, and both of them must have more buildings or we cannot hope to educate our boys and girls at home. 3

Acting in accordance with the Governor's direction the two governing boards made known the needs of their respective institutions and requested that an appropriation of $380,000 be made for the State University and $360,000 for the State College. Since the amounts
requested were much larger than previous legislative requisitions, committees were appointed to visit the Iowa educational institutions and study their needs. Appointed as a committee to visit the University were Representatives F. E. Jones and E. W. Weeks and Senator F. L. Maytag. These committeemen, after completing their visit on the University campus and their study of the institution's needs reported to Iowa City residents that they were well pleased with the results of their investigation and felt confident that the legislature would deal liberally with the University. The generosity of the legislature predicted by the committeemen was not, however, recommended by them upon their return to Des Moines. Indeed, it was the majority report and recommendation of this Committee that precipitated the first of the three crises, that of 1904.

Signed by Senator Maytag and Representative Jones the report of the committee was filed on March 18, 1904. Herein it was recommended that an appropriation of only $80,000 be made for the University as compared to the $380,000 requested. Far more critical was the recommendation in regard to engineering. It is, they declared in their report:

the judgment of your committee that no buildings should be erected and that the department should be discontinued entirely, for the reason that we have, at Ames, one of the finest engineering halls in the country, and we believe that all the expenditures should be concentrated in one place.
In regard to the dam on the Iowa river, recognized by experts as valuable for engineering development the committee reported:

We cannot recommend an appropriation for this purpose. It is not a necessity and the benefits that the University and its students would derive would not justify an expenditure for that purpose. 9

Unwilling to join his colleagues in the majority report, Representative Weeks filed a minority report in which he not only recommended an appropriation of $271,000 for the University but also recommended that the department of engineering be continued. In his report he declared:

I do not favor doing away with this very important department of the University. There are students who come to this institution for advance work, or for work of such a character not obtainable in other institutions of the State, and who desire, while they are doing such work to acquire some practical knowledge of engineering and kindred subjects. Under present arrangements, this class of students can be accommodated; otherwise, they would be obliged to take a part of their educational studies at one institution and a part at another at great expense and inconvenience. I am not able to conceive of a great university at which knowledge, as to practical engineering and like subjects, is not obtainable. I would further suggest, that under the grant of land to the University and the laws establishing the same, it was contemplated the establishment of a great university, and to take from it, one of the most useful departments would be in violation of the spirit and intent of the fundamental laws creating the same. 10

Reporting his opinion in regard to the importance and necessity of maintaining the dam Representative Weeks stated:
In reference to this matter, it must be understood that for years there has been maintained and operated a water plant just above the grounds of the university. The dam across the Iowa river, which furnished this power, went out during the last year. The owner of the riparian rights and privileges offers to donate the same to the State for the use of the university. It will require funds to protect and preserve these rights and to rebuild the dam. After the dam has been rebuilt the State will have a valuable property, consisting of riparian rights, privileges and water power.

I therefore, recommend an appropriation for this purpose, (not annually) in the sum of $6,000.11

The reports of the committee so divergent in their recommendations were obviously not without serious implication and consequence. The disestablishment or further development of engineering was one question. The discontinuance of a department already established in the university and its establishment at the State College of Agriculture and Mechanic Arts was another. Both involved the future of Iowa's educational interests and system. Perhaps, never before had the future of not only the University and engineering therein, but of higher education in Iowa, depended so much upon any single act of the legislature. Sensitive to the almost revolutionary consequences and the precedent that would be established, if the majority report were adopted, many legislators questioned not only the advisability of such action but even the integrity of the report. Reasons for doubt became well founded when in summary fashion the original recommendation of an eighty thousand
dollar appropriation was invalidated by another recom-
mending that it be increased to $120,000.

The indecisiveness of the Committee members
sponsoring the majority report and the violent reaction
of university people in all sections of the state
prompted serious minded legislators to recognize the need
for further study of the institutions concerned and thus
satisfy themselves in regard to the integrity of the
reports. Similarly, administrators of the institutions
and civic leaders in both cities recognized the legislators
need for more complete knowledge and became convinced that
if they were in possession of the facts concerning both
institutions their action would not inflict injury on
either. Local commercial clubs, therefore, issued invi-
tations through Representatives Koontz of Iowa City and
Greeley of Story City to the members of the Thirtieth
General Assembly, inviting them to visit in Iowa City and
in Ames for the purpose of studying the needs of the two
educational institutions. The invitations were accepted
and plans were made for the journey to the two educational
centers. Needless to say that both institutions almost
at once began to prepare and arrange for the advent of the
distinguished visitors.

The State College of Agriculture and Mechanic
Arts campus was visited, on March 9. Received and enter-
tained in almost regal fashion by faculty, students and townsmen, senators and representatives, alike, during their return journey to Des Moines expressed a fuller and more rich appreciation of the institution's needs. This visit to Ames was followed, on March 24, by one to Iowa City. In similar fashion the law makers received a genuine reception from members of the faculty, university students and local citizens. No effort was spared and great energy was expended in order to impress the legislators favorably and thus win their support for the university and the maintenance of the engineering department. The people of Iowa City while not intent upon bribing the Thirtieth General Assembly to do better things by the University were intent upon impressing that law-making group that the work done by the University was indescribably greater than many members of the Assembly seemed to conceive. The prevailing sentiment of all Iowa City as described in the Daily Iowa State Press was almost an order to the legislators,

Give the University a fair unprejudiced examination — see what it is doing and think what it needs to do more, and we have no fear that you will not adequately provide for the institution when you return to Des Moines.

That there might be no doubt concerning the sincerity of their conviction or the earnestness of their welcome senators and representatives were tendered the keys of the city and provided with all means available to make their
visit a success. Driven in carriages from the Rock Island station to the liberal arts auditorium they were accorded a continuous ovation characterized by applauding and cheers in which the engineers were given considerable attention. It was very clear to all that witnessed the procession to the auditorium or heard the student cheers that they were determined not to part with the engineers. The soul of hospitality they did not let the visitors forget that the university and its supporters believe they have been shabbily dealt with by the appropriations committee in its recommendations and that Ames has been favored at their expense.

The exercises in the Auditorium were not long but they were of great interest. Following a brief and cordial address of welcome by Mayor Frank K. Stebbins, President George E. MacLean bade the guests welcome in the name of the University. Likening the University to Old Capitol - plain, solid and symmetrical the President declared: we are "plain folk" in as much as one third of our students are self supporting and over seven hundred are the children of farmers. The solidarity of the university he described as being evidenced by the fact that during each of the past two bienniums the number of students increased about three hundred even through standards equal to the highest in the country were constantly maintained. Concluding his brief address the President declared, Old Capitol is beautiful and rich in
its symmetry, and "with God's help and the legislature standing by us we shall make the University and all the departments belonging to it more and more symmetrical - practical as well as theoretical." Speaking after President MacLean was Lieutenant Governor Herriot. In the absence of Governor Cummins, the Lieutenant Governor expressed sincere appreciation for the hospitality extended to the law makers and assured his auditors that he was eager to see the University's great future as depicted by President MacLean realized in its fullness.

Of the talks that followed, that by Senator Garst, and Representative Weeks were most significant. Chairman of the Senate appropriations Committee, Senator Garst transformed the "agonizing groans" of the engineers which interrupted him, as he declared, that the legislative committee desired to divide with absolute justice and equality according to the needs of the various institutions, into rousing cheers by the suggestion, "I believe there is yet time to rectify any errors, if any have been made." Speaking only after a prolonged and determined demand on the part of the students and after quieting tremendous applause, Representative Weeks briefly and pointedly urged the students to always carry in their hearts one sentiment — loyalty to citizenship, institutions and home — and this he declared would be conducive to goodness and happiness and make of Iowa that which it
Preconceived notions of a disparaging nature in regard to the University and the department of engineering were unquestionably altered before the legislators had ended their visit. The manifestation of loyalty and of determined opposition to the removal of engineering as well as the completeness of the engineering shop, combined to win the good will of the law makers. Commenting on the visit to Iowa City a prominent alumnus expressed his belief that the action of the committee unfavorable to the university would never be made the action of the entire assembly. Enlarging upon his statement he declared that the existing political conditions would cause the senate to adopt the report of the sub-committee giving the University $120,000, while the house he believed, partly, because of the number of university alumni and partly because of the existing political conditions, would adopt the minority report of Representative Weeks and thus, maintain the department of engineering at the University.

The determination of the students not to give up the engineers and the measure of their protest to such a dismemberment of the University consisted of more than an excellent demonstration at the time the law makers were their guests. Protesting the action of the legislative committee, students from every college and department of the University signed a memorial. Directed to the members...
of the Board of Regents it was stated in the document that,

We the undersigned students of the State University of Iowa respectfully file our protest against the recent proposal to dismember our university and create a new university at the College of Agriculture and Mechanic Arts and earnestly solicit your utmost influence and activity in averting this catastrophe.

We would call your attention to the fact that all modern education is conducted along practical lines; medicine and dentistry being taught by means of clinics; laws by the case method, and the physical sciences by their application to engineering.

To discontinue engineering at the University for any reasons which maybe assigned would be to set a precedent by which, as soon as the College of Agriculture and Mechanic Arts shall have by any means equipped itself for conducting work along other lines, such work may be abolished at the University. The discontinuance of our departments of biology, of physics or of chemistry maybe demanded at once upon the same grounds, and the University thus reduced to a mere group of professional colleges feebly allied to a college of letters. We feel that the state would be treating us as well as the 6,000 alumni who have gone before us and those who may come later, in a most unfair manner by taking from us the privilege of referring with pride to our alma mater as a real University. For these reasons we ask your utmost endeavors in preventing this most unwise step and freely volunteer our services to assist in the cause in such way as you may indicate.

Student protests and resolutions were supplemented by those of the university alumni. The mere proposition to abolish engineering at the University and effect a consolidation of the work at the State College of Agriculture and Mechanic Arts aroused an almost spontaneous storm of opposition among the engineering and other
sensitive to the feeling among the alumni and cognizant of the disaster that threatened engineering at the university unless alumni and friends rallied to its defense, John Hamilton, President of the Des Moines Association of University Men and Women and Harvey Ingham, President of the Iowa Alumni sounded the alarm. The two presidents called a meeting of their respective organizations for March 25 at the Hotel Kirkwood, in Des Moines. Attended by approximately one hundred of alumni the meeting was notable for the earnestness of effort to prevent any dispoiling of the university and the friendly feeling evinced for the other educational institutions of the state. It was the opinion of this group that the province of the University's educational activities had long been defined and this province it must either completely fill or become the standing monument to Iowa's failure in its chief educational enterprise. It was their conviction that as the future greatness of the State College was to be found in its being the greatest agricultural school in the world and not as a University so the greatness of the University would be realized in its present form and not in its reduction to the level of a college. That their stand might be better known and made more vocal a strong resolution prepared and signed by a committee composed of John J. Hamilton, J. J. McConnelly and W. O. Finkbine was adopted.
In the resolution it was declared:

Resolved, by this meeting of alumni of the State University, that we hereby declare our friendliness to all of the great state educational institutions of Iowa and our belief that each of them should be so generously supported that it shall continue to rank among the best of its kind and class in the country. We appeal to the legislature to pursue a broad and liberal policy toward these useful institutions; increasing their facilities as the growing wealth of the state shall make practicable. We are earnestly in favor of maintaining at the State University all of its present departments and all of its present departments that are maintained at other state universities of the land, including the engineering department, believing that Iowa— one of the greatest of states—should keep steadily in view the purpose to make its university the peer if not the superior of any other. To this end we ask that a liberal appropriation be made by the present general assembly.

The resolution adopted by the General meeting of the alumni on March 25, was presented to the senate on the following day by Senator Shirley Gilliland. At the same time Senator Courtright presented a petition signed by fifty four alumni of the University and residents of Black Hawk County. In their petition this group of loyal alumni went on record as being in favor of "liberal support of the University and especially of its engineering department." Although alumni endeavored to prevent the removal of engineering from the University, by systematically inducing the legislators to treat the University, by systematically inducing the legislators to treat the University more liberally than they had in
the past a definite movement toward limiting the
spheres of the school at Ames and the State University
was started as Representative A. F. Hambleton presented
a resolution in which he declared:

Resolved, By the house the senate con­
curring, that a committee of four from the
house and three from the senate to be ap­
pointed to take into consideration the ad­
visability of a consolidation and concentra­
tion of educational interests as to courses
of study in the Iowa State University and the
Iowa State Agricultural College and report with
such recommendations, plans and outline of work
often due consideration and advice, giving such
information as may be for the better under­
standing and enlightenment of this assembly in
the future success of our educational work. 42

Although the resolution was defeated in the house on
March 30, without roll call, its introduction caused
great alarm among alumni leaders who induced their
friends in the legislature to send for Professor A. V.
Sims. Bringing with him, facts and figures pertaining
to the profession of engineering and engineering educa­
tion at the University he proved the erroneousness of
charts and statistics circulated by his opponents to
minimize the importance of engineering at the university.
The influence exerted by Professor Sims in securing
favorable legislation for the department of engineering
can scarcely be exaggerated. By determined effort and
by able organization he directed the battle in the legis­
lature to retain and develop engineering at the Univer­
sity.
That the crisis was nearing its end without the removal of engineering from the University became apparent on March 23, as the senate appropriations committee made its final report, recommending at the same time, that the department be retained and an appropriation of fifteen hundred dollars for its support be allowed. At almost the same time, the house committee voted an appropriation of sixty thousand dollars for engineering. The pressure brought to bear upon the legislature by alumni lobbyists had been tremendous and the fruit of their effort was evidenced in the action taken by the committee. The senate committee report made clear the decision by that body that engineering should be continued at the university and with the passage of the House Bill by the Senate, on April 11, the crisis of 1904, which threatened the very existence of the engineering department passed into history.

Upon receiving news from Des Moines that the engineering department would be left at the University and that an appropriation had been made for a dam across the Iowa river and a new engineering building the engineering students paraded the streets making loud and sundry noises. Hand bills were printed and distributed advertising the "Shed" for sale while the enthusiastic occupants daubed it with red paint. The culmination of the demonstration was reached on the morning of April
12, as students of the engineering department and other university students assembled at the Rock Island Station to welcome the successful university lobbyists on their return from Des Moines. The demonstration which greeted President MacLean, and Professors Sims, Weld, and MacBride upon their arrival in Iowa City was second only to that which was staged for the Iowa Legislators upon their visit to the University. Like the law makers they were met by shouting students accompanied by the University band, the staunch defenders of engineering and University integrity were escorted in a carriage, drawn by nearly all the students of the engineering department, to the steps of the old engineering shed where they were accorded a great ovation. Amid the deafening cheers of a thousand students and the booming of the cadet cannon, north of Old Capitol, the honored gentlemen ascended the steps and took their places for the informal program under the direction of Hirshey Welsh, senior engineering student.

First called upon by the chairman for a talk was President MacLean. Speaking briefly after the cheers subsided the University President said:

Yesterday was the greatest in the history of Iowa University, for when the $208,000 appropriation was passed by the senate, the Thirtieth General Assembly of Iowa thereby recognized the fact that this institution is to be the great University undivided for all time. It means that the department of engineering is to be one of the great colleges of the University.
The president was followed by Professor MacBride who after briefly reviewing the fluctuating history of the appropriation which was finally passed, spoke in the warmest terms of the two men who had been most influential in securing the passage of the bill, "the only two who stood pat, Hon. G. W. Koontz and Professor Sims."

The next speaker was Professor Sims. Perhaps never before was there such cheering on the part of the engineers as the popular head of the department took his place. Obviously, the professor was about the happiest man on the campus for it had been his aim ever since he had been at Iowa to have engineering recognized as one of the great colleges of the institution. His hopes were now realized and largely as the result of his own work. Modestly, however, he gave credit to the alumni who united as one man and made things so lively in all parts of the State that a decided change of feeling towards the University was experienced in the Senate and in the House. In conclusion he said,

One reason above all others that made the senate pass the bill for the entire appropriation was that every senator knew that George Koontz was at the other end of the bill and if it wasn't passed he wouldn't give in an inch and would keep them there until next summer. 54

The satisfaction expressed and manifested by most everyone connected with the University was
characteristic of that which prevailed throughout the state. Most of the newspapers had been liberal in their praise for the university throughout the contest and from the beginning declared it was an institution deserving of liberal support. The real significance of the legislative act and its reason for occasioning such joy is well expressed in a letter written by President MacLean to Senator James E. Bruce. After expressing his gratitude to the senator for his loyalty to the university and the great educational causes of Iowa the President declared:

I do not need to say to you that the full significance of the action of the Assembly reaches far beyond the matter of appropriations. The matter is in the way of a determination that there shall be one, and that a real university, undivided, at Iowa City for the whole state of Iowa. The tacit endorsement of the policy of having a University with standards and a practical university in the way of applied science, engineering, etc., will strengthen us at home and abroad. 56

The action of the thirtieth general assembly was more significant and far-reaching than President MacLean had imagined. This same Assembly after appropriating sixty thousand dollars for engineering at the University, appointed a Committee "to investigate the system of management and affairs of the state educational institutions of Iowa." 57 In the organization of this committee and the results of its investigation may be found the first beginnings of another crisis which in 1912 threatened again the very existence of engineering at the University.
After full investigation and consideration an elaborate committee report was made to the thirty-first general assembly recommending that a single board of control for the three educational institutions be created. The report was followed by the introduction of a bill in both this and the succeeding assembly. Prepared and introduced by the Committee Chairman, Senator William P. Whipple, the bill provided for "a board of control to manage the affairs of the State University, the State College of Agriculture and Mechanic Arts and the State Normal School". Undaunted by the defeat his measure suffered in the house, each time, Senator Whipple with the courage of his conviction resolutely and confidently introduced a revised and modified measure in the thirty-third general assembly. This bill provided for an act to create a State Board of Education for the State University, the College of Agriculture and Mechanic Arts, and the Normal School, and to prescribe its duties and to provide for the management and control of the State University, the College of Agriculture and Mechanic Arts and the Normal School, to make appropriations therefor, ... After considerable discussion the bill passed both houses. According to the new law the board which it provided for was to be composed of nine trustees, appointed by the Governor and confirmed by two thirds of the senate in executive session prior to the adjournment of the Assembly.
Shortly after the members of the board had been selected by the Governor and their appointment confirmed by the Senate they met at the State Capitol and elected James H. Trewin, President. At a later meeting held in Iowa City the members of the Finance Committee were selected. This committee was composed of three members from outside the board and had for its President, W. R. Boyd. Other members were D. A. Emery, Secretary and Thomas Lambert.

On July 1, 1909 the members of the Board of Education entered upon their duties mindful of the Legislature’s intent when it passed the bill creating this new form of government for the institutions of higher learning in Iowa. To them "it was evidently the intention of the Legislature that the three State institutions governed by the Board should be coordinate parts of the general educational system of Iowa." From the beginning, therefore, the Board of Education had under consideration the coordination of the several institutions committed to its care, to the end that there might be created for the people of this state a comprehensive system of higher education wherein duplication would be reduced to justifiable minimum and the highest efficiency attained.

Determined as was the Board of Education to end rivalry and reduce duplications to a minimum the Board was not of the opinion, in 1910, that engineering in the College
of Applied Science at the University or in the State College of Agriculture and Mechanic Arts should be abolished. It was considered feasible, however, to look forward to a time when these colleges should be co-ordinated in such a way that duplications would be few and insignificant.

Urged to give immediate attention to the problem of coordination and at the same time anxious not to act prematurely or without sufficient knowledge of the work each institution was attempting to do the Board of Education, in executive session, on July 16, 1912 adopted the following resolution:

Resolved: That the Finance Committee be instructed to report to this Board at its next meeting on the feasibility and advisability of carrying out the co-ordination of work in the three institutions and particularly the consolidation of the Engineering schools at Ames and Domestic Technology at the University, along lines substantially presented to the Board members recently in a prepared memorandum on the subject and that they prepare financial and sentimental facts in connection therewith.

Pursuant to the authority thus delegated, the Finance Committee undertook the work of investigation in order that an intelligent plan of co-ordinating might be formulated. The investigation having been completed prior to October 8, 1912, the report was submitted on that date to the Board of Education then convening in Cedar Rapids to consider its report to the Governor and a
requisition from the Legislature.

Basing the report upon a previous memorandum the Finance Committee declared:

Sometime ago a memorandum setting forth a tentative plan of co-ordination was somewhat carefully prepared and the undersigned were satisfied that taking all things into consideration this plan offered the best possible solution of this co-ordination problem. Further study did not materially alter our opinion; but realizing that we were not educational experts, we thought it wise to submit this to several eminent educators. 79

After stating their problem to a number of educators, among whom were, A. Ross Hill, Charles R. Van Hise, Dr. K. C. Babcock, Henry S. Pritchett, and William P. Draper, and receiving replies which they interpreted to be an endorsement of a plan to co-ordinate and consolidate engineering, the committee made the following recommendations:

First: That all engineering be centered at the Agricultural College.

Second: That all courses in professional education and in Liberal Arts now offered at the Iowa State Teachers College which extend beyond the sophomore year, be discontinued.

Third: That all courses in General Science now existing at the College of Agriculture be discontinued, and that the field of Household Arts be opened at the University. 80

The recommendations as presented to the Board were signed by only two members of the Committee, - Mr. W. R. Boyd and Mr. Thomas Lambert. The third member,
Mr. D. A. Emery, refused to concur in the recommendations insofar as they affected the State Teachers College. Upon receiving the committee report, the Board of Education, with two members absent, resolved by a vote of six to one that the changes recommended "be and are hereby ordered." This action was followed promptly by a report in which the Board of Education "made public a long statement justifying the change." The view of the Board as expressed in the statement was as follows:

The state board of education has taken action touching a matter which it regards as the most important and far reaching duty with which the board is charged. This action has been taken after mature deliberation and is considered the best possible solution of the problem, all things being considered, which could be arrived at. The intent of the general assembly creating this board was exceedingly plain. Duplications as between the several institutions were to be reduced to a justifiable minimum. The task thus imposed was not without great difficulty. Reconstruction in anything is no easy task. Educational institutions are invariably jealous of their prerogatives and cherish their traditions as something sacred. It was not to be expected that any institution would willingly give up anything it possessed, even though it was very clear to an unprejudiced observer that it would be for the benefit of the state as a whole to make such sacrifice.

It was clear therefore from the beginning that little practical help in the solution of the board's great problem was to be expected from the officers and faculties of the institutions. They were too near the problem involved to view the questions from the standpoint of the whole. It was because this fact was recognized by the legislature that this central authority was created. If this central authority had existed from the beginning few of the mistakes which are now
The trouble has been that our educational institutions have developed separately and with little regard for each other. It was perfectly natural that organized and governed as they were, conditions should be as they are. The question confronting the board was: Should these conditions confessedly extravagant and productive of weakness, be perpetuated for sentimental and selfish reasons?

The board has answered this question emphatically in the negative. At the same time in attempting a solution, due regard has been paid to the human element, and to the fact that reconstruction and construction de novo are two different things. Neither has it been forgotten that public institutions and especially educational institutions, cannot be dealt with as privately owned and controlled institutions may be handled. If it had been possible to approach this problem without being compelled to take into consideration anything but the future, and looking solely to economy and efficiency, the wisest solution would be to consolidate these institutions together in one place. The initial loss in the abandonment of one or more plants and the enlargement of the other, would seem great, but it would be economy in the end. The time was when this might have been done without entailing any great burden, but that time has passed and such a solution would not be sustained by public opinion.

The board realized therefore that these institutions must remain separate. The obligation was to formulate a plan to reduce duplications to a justifiable minimum and serve the educational needs of the state in the most effective manner throughout the long future, in comparison with which the years which have already elapsed are so many heart throbs.

The statement of the difficulties encountered in an attempt to solve the educational problem and thus eliminate the existing duplication in the three state educational institutions was followed by a plan of co-ordination together with reasons for its acceptance by the Board.
of Education. It was stated that:

Sometime ago a memorandum setting forth a tentative plan of coordination was carefully prepared. The memorandum was as follows:

First, that all work in engineering be centered at the Agricultural College.

Second, that all courses in professional education, and in liberal arts, now offered at the Iowa State Teachers' College which extend beyond the sophomore year be discontinued, and centered at the university.

Third, that all courses in general science and domestic science now existing at the College of Agriculture be discontinued and that the field of household arts be opened at the University.

Reasons for these recommendations may be briefly summed up. It was deemed indefensible for the state to maintain two colleges of engineering covering practically the same field within 125 miles of each other - as indefensible as it would be to maintain two colleges of liberal arts, one at Cedar Falls and the other at Iowa City. And it was further held that the State Teachers' College would better serve the educational needs of the state by concentrating its energies on the training of teachers for the elementary schools. To develop a thorough college of liberal arts at the Teachers' College in connection with the professional courses in education, would necessitate strong departments in the modern and ancient languages, in philosophy, psychology and in each of the sciences, also extensive laboratories, libraries and museums. All these now exist and must continue to exist at the University, where the annual cost of this work in salaries to professors and instructors is $167,805.

Moreover, the facilities for professional training in education are thoroughly established at the University, and by comparatively slight increase in expenditure will be adequate to supply the entire demand. There are also at the University advanced and graduate courses in the various liberal arts subjects, enrolling 223 graduate students most of whom expect to teach. To duplicate these courses at the Teachers' College is deemed futile extravagance.
Finally the board holds that the most potent educational need in Iowa today is a supply of properly trained teachers for the rural and elementary schools. To meet the demand in this field, will more than exhaust the present resources of the Teachers' College. This institution should not only bend all its energies to this mission, but it should encourage the establishment of several additional institutions in other parts of the state to aid in the same service.

Under the proposed plan of coordination the function of the State Agricultural College will be to serve agriculture and the profession of engineering in Iowa. Naturally this work will necessitate certain duplications in courses with the university courses in mathematics, in English, in modern languages and in economics. Such duplications now exist and they should continue to exist with this restoration: At the State Agricultural college they should each serve as a means of efficiency to a professional course in engineering, agriculture and veterinary medicine, and as a part of the general and separate culture course. In other words, it is clearly not wise for the state to support a college of liberal arts at times, and to duplicate this work at the university.

In an effort to justify further the act of coordination and at the same time win legislative support the Board of Education in a report to the Governor and the thirty-fifth general assembly declared that "theoretically, engineering might more logically have been established originally and exclusively at the University," but so far as the engineering colleges themselves are concerned, the one at the University lacks advantage from the viewpoint of age, equipment, number of students enrolled and impressions made upon the state generally. In an effort to justify their exaggerated claims and thereby prove
that all rights engineering belonged and should be consolidated at Ames, they resorted to a form of chicanery. That engineering had been taught at the University for many years "after a fashion" they did not deny but its importance they endeavored to minimize by calling attention to the fact that the College of Applied Science was not established, until 1905, whereas the department of engineering at the College of Agriculture and Mechanic Arts was established in 1868. By a comparison of the engineering investments at the two schools the University was made to appear much inferior. Estimating the value of engineering property and equipment at the University to be $201,000, they fallaciously estimated that at the College of Agriculture and Mechanic Arts to be $550,000, thus reducing engineering at the University to a position that almost forbade comparison. Student enrollment, they declared was three times greater at the State College than the University and unlike those at the University they touched most intimately both the industrial and commercial life of the State. Designed as were the arguments to justify preconceived attitudes and foster a movement to effect an engineering consolidation at Ames they were destined to fail, as opposition to their purposes became organized and pitted against them.

Previous to the authorization of the Finance Committee to make an investigation the subject of co-
ordination was not only suggested but discussed formal-
ly by men in business, legislators and prominent edu-
cators. Alert to the seriousness of the question, as
well as the Board of Education's sentiments, Mr. Arthur
J. Cox, of Iowa City, fearing that action might be taken
before opposition could be effectively organized, wrote
to Mr. W. D. Lovell, President of the University Alumni,
and advised him of the "menace that threatened the
Engineering Department" and urged that he "bring pressure
to bear on the President and on the Board." In an
effort to secure more information on the subject Mr. Lovell
wrote to Dean William Galt Raymond. In his letter, under
date of July 6, 1912, Mr. Lovell wrote:

I will appreciate a plain statement of the
facts from you, as I believe that you are as
much interested in the matter as any one of us,
and I will also appreciate your suggestions as
to the mode of procedure, and when action
should be taken. 92

Nor was he in error in his belief regarding the interest
of Dean Raymond. In his reply the Dean gave a most com-
plete and comprehensive analysis of the situation, to-
gether with an opinion regarding the procedure that
should be taken by those interested in the matter. De-
scribing the facts of the case and the procedure to be
followed at this time Dean Raymond wrote:

.... The matter unquestionably is up for dis-
cussion. The Board of Education has not dis-
cussed it formally as yet but has had a number
of informal discussions and as yet is not ready to act. It has informally, I think, but never the less by telegram or letter assured the president of the State College of Agriculture and Mechanic Arts that engineering will not be abolished at that institution. The Board, however, has thus far said nothing as to what shall be done with engineering at Iowa. I think I am correct in saying that the president of the Board, Mr. James H. Trewin of Cedar Rapids, is in favor of consolidation of engineering work at Ames. Mr. Brenton, a member of the Board who represents the old Board of Trustees of Ames, is also considered to be favorable to such a movement. I know that Mr. Trewin has so expressed himself privately.

Just what the attitude of the President of the University is I do not know, but I do know that apparently he is enthusiastically in favor of continuing the engineering school here though he has said to me definitely that he believes some economy will result in the consolidation of the engineering schools at one place or the other, that if it were now forced upon the Board to consolidate and left to the Board to say at which school the consolidation should be, he believes it would be at Ames, and from his manner I doubt if he would oppose such a consolidation under those circumstances, but I doubt if that situation is likely to arise. The president has said to me also that if it could be shown that the best interests of the state seemed to point to a consolidation at Ames, he should not oppose it, but he insisted that it would have to be very plainly shown that these results would obtain. He has recently interviewed Mr. Holbrook, a member of the Board of Education, and a former member of the Board of Regents of the University, and presented Mr. Holbrook with a series of arguments that I had given him, in which arguments Mr. Holbrook seemed to be interested and of which he asked to have a copy which was given him. I had a talk with Mr. D. D. Murphy, an alumnus of our Law School and a member of the Board of Education, at commencement time and Mr. Murphy told me that if the matter were to come up for discussion at that time with only the one course open - namely, that of consolidation - he felt that the consolidation would go to Ames, and, as nearly as I can gather, this is because it is thought that a fewer number of alumni would be antagonized and consequently less trouble would
arise than if Ames were to be deprived of its school. Of course, in this matter the Board has considered only the engineer-alumni, whereas there are a great many other alumni in the University who would take an active hand in opposing such a movement, and I fancy a stronger opposition would arise than the Board realizes. Mr. Murphy suggested that he believed the Board would welcome a rational plan of coordination for the two engineering schools and said that he believed that whatever effort was made for such coordination or for the retention of engineering at Iowa, that effort must be made with the expectation that engineering would be retained at Ames.

When Mr. Kuehnle was here at commencement time, he read the riot act to President Bowman, Mr. Murphy, and Mr. Holbrook and according to his own statement he told the president that, if he wished to kill himself, he would allow the engineering school to be removed, and if this were done, he, Mr. Kuehnle, would spend $10,000 of his own money to destroy the Board of Education at the next legislature. I think he somewhat offended the president in his blunt statement and at the same time I am inclined to think that he stiffened his backbone somewhat.

There are a great many rumors flying back and forth, getting into the newspapers, first that engineering will be consolidated here and then that it will be consolidated at Ames, and some people interested in Ames are making more than they should of the arrangement that the Board has made with the incoming Ames president and are reporting that the Board has agreed that engineering should be removed from Iowa, which is not the fact, and not that engineering should stay at Ames, which is the fact. These rumors and the unrest that they produce in our faculties and the uncertainty that must exist in the minds of students proposing to take engineering is doing great damage to our school, and I presume somewhat to Ames.

While I myself do not believe that anything will be done immediately and moreover that engineering will be destroyed here, nevertheless there is just enough uncertainty in my mind to prevent me from purchasing a home here which I had intended this spring to do, and some of the other members of our faculty are similarly situated, and some of them would be very
easily moved from their present positions because of the existing uncertainty. Having this in mind, I have suggested to the president that the Board take action at its next meeting tending to quiet these rumors and the action. ... Of course, we would rather the Board would act finally and say that engineering is to be retained at Iowa and, if they wish, also at Ames and that a scheme of co-ordination would be worked out later, but I think the Board is not quite ready to do this and I feel confident that Mr. Trewin, its president, and Mr. Brenton representing Ames would oppose it.

On the Board I think that Mr. Baker of Davenport, Mr. Holbrook of Onawa, Mr. Murphy of Elkader are all certainly our friends - Mr. Baker because he has so expressed himself to me, Mr. Murphy because he is an alumnus and has also so expressed himself to me, and Mr. Holbrook because he was a former student and member of the old Board of Regents. Mr. A. B. Funk of Spirit Lake is, I think, also favorably disposed toward us, but this is only an impression and I have had no expressed word from him in this matter. Mr. Roger Leavitt of Cedar Falls is also favorably disposed toward us, but he is not a strong man on the Board. He is a relative of B. J. Lambert by marriage, and, therefore, has a personal interest in us here. Mr. Edwin F. Schoentgen of Council Bluffs, an architet by training and a wholesale grocer in business, a graduate of the Boston Tech I do not know about.

It is a curious thing that, while the president I am sure is with us at least until he feels that it would be policy not to be, yet with one exception everything that he has done during the year has tended to hurt us rather than to help, although I think this has been without intention and merely happened so and has been due to what I have concluded to be his too quick judgment or else to unfortunate advice of those to whom he discusses his policies. The one exception to which I refer is the permission he gave us to advertise effectively and the interest he took in this advertising, and I think we have sent out this year the most effective matter that has ever gone out.

Now as to what procedure should be taken by those interested in the matter, I hardly know how to advise. I think that if a wide movement could be undertaken by the alumni, not confined to the
engineering alumni, in which individuals should write forceful letters to the president of the University, assuming that he is in entire sympathy with the retention of engineering here and offering any assistance that the writers might be able to give if he should stand in need of it at any time, and, of course, themselves deplored the removal of the engineering college, not as a matter of sentiment but because such a college belongs to the University and because the present college has demonstrated its value to the University and its right to exist, such a movement might not be amiss. Moreover, if a few influential alumni could bring pressure to bear on members of the Board to settle the matter once for all that engineering shall remain at Iowa and though coordination of work may be discussed later, such pressure might accomplish a great deal of good. I think such a resolution as I am proposing which I gave to the president is likely to be brought before the Board at its next meeting on the 16th of this month and if it could be amended so as to say more positively that engineering at Iowa shall not be discontinued as the Board has informally said to the president at Ames, such influence would be a good thing provided it were effective.

We do not, however, have a united support at home as they do at Ames for, in spite of the fact that engineering at Ames has dwarfed the agricultural department and made the agricultural student almost a joke, yet the agricultural department stands up loyally for engineering, knowing apparently that if that branch were taken away, a large part of the attendance would be destroyed, while at least four of our principal people in the College of Liberal Arts (possibly more unknown to me) feel that the loss of engineering here would mean nothing more than the loss of a few students which would be easily made up by the larger sum of money that could be distributed among the departments of Liberal Arts which apparently in their minds constitutes the real University. Such persons as Mr. Ansley, head of the department of English, Mr. Bush, head of the department of French, Mr. Eastman, head of the department of Latin, and Mr. Starbuck, professor in the department of psychology and philosophy, seem to have this feeling. Of course Professor Smith of the department of mathematics, Professor Steward of the department of physics, Professor Rockwood of chemistry, and Professor Kay of geology are equally positive that the college should
remain here and belongs here. Just what the attitude of other members of the faculty of the College of Liberal Arts may be, I do not know, but I presume some are friendly and some otherwise.

In conclusion, I may say that Mr. Cox is not mistaken because the matter is still up for serious consideration and it only remains to know what is best to be done. I think it is certain that something should be done to make sure that we do not fall by the wayside for the lack of doing in time...

The exchange of letters at this time, between Mr. Lovell and Dean Raymond inaugurated and outlined in general the movement to prevent the disestablishment of engineering at the University. Desirous of utilizing alumni influence, which he considered would be a potent factor in effecting the ultimate solution of the problem, Dean Raymond writing to Mr. Lovell, under date of July 11, suggested that an appeal be made to Mr. Trewin, whom he described as a man, "very set in his ways", yet, "always open to suggestion", and of "having his opinions altered by proper presentation by the right person." In explanation of his suggestion the Dean added that Mr. Trewin's attention should be called to the fact that the educational system must be planned not for the present but for the future and that twenty five or fifty years from now a real engineering department or college will require so much of the work of an arts college that if it is established at a college of Agriculture and Mechanic Arts there will be even a greater duplication necessary to maintain the two
schools at the two institutions. And it should perhaps be called to his attention that there are but two universities of any standing in this country which do not have engineering colleges or departments. 94

In the same letter he urged that effort be made to convince President Bowman that the alumni, not only engineering but other influential ones, will disapprove of any attempt to destroy the engineering department of the University and will back him up in any effort he may make to retain it. 95

The sentiment of the Alumni had already been made known, however, to President Bowman. In a letter to the President written on June 25, 1912, a prominent and active alumnus, Carl F. Kushnle of Denison, Iowa, wrote:

I had a long talk with Senator Funk in Chicago. We discussed the engineering matter. I also talked over the matter with Mr. Murphy and Mr. Holbrook at Iowa City. These three men agree with me that every first class university must have a school of Applied Science. I have not seen a University man who favored cutting off the engineering school. In fact the very suggestion stirs them to indignation. 96

Without regard for the alumni sentiment and their unofficial protests to the proposed change or the opposition manifested by the three schools toward the plan of coordination ever since it was formulated the Board of Education took formal action, on October 8, 1912, which if not rescinded or modified disestablished engineering at the University of Iowa.

Almost at once following the announcement of the Board of Education's drastic action, faculty, students and alumni, with but few exceptions, in true American
fashion became almost as one to wage a battle to preserve the integrity of their institution. The toscin was sounded and the call for immediate action was sent out. In a letter to Mr. Lovell, dated October 10, 1912, Dean Raymond wrote:

As I wired you last night the Board of Education has agreed to concentrate all engineering at Ames, to discontinue the general science and domestic science courses at Ames, and establish household arts at Iowa City, and to discontinue all work above the sophomore year at the State Teachers' College at Cedar Falls, concentrating the higher education work here. President Pearson, the new president of Ames, while disturbed at the action was taken entirely by surprise and, being a new man, having been on the ground only a month, is disposed to let the matter stand and do the best he can with it. President Bowman is disposed to consider the matter final and to deprecate any outburst or serious opposition on the part of the alumni. Whatever your attitude may be and whatever you may propose to do in the matter, I think you would do well, if possible, to meet with some of the more influential alumni and discuss the matter. Of course, if you propose to follow the recommendation of the president any such meeting will be unnecessary. I do not know that anything can be done to alter the situation, and I am free to say that I think the worst possible action has been taken for the state as a whole and for the University in particular, but I do not feel that it is my place to enter any formal protest or active opposition, beyond expressing my opinion, as I have done privately, rearrangement have so far as I know, none of them been worked out so that I don't know what is proposed to do with our faculty or equipment nor the faculty and equipment made unnecessary at Ames. Quite naturally the boys here are in arms and are demanding that the alumni make an effort to nullify the present action of the Board 100

Instead of being "in arms and demanding", the engineers proceeded cautiously and with dignity to protest
the action taken by the Board of Education. By their procedure and course of action, the engineers "proved themselves men and gentlemen in a crisis which usually brings to the surface the worst elements in man's nature."

Promptly upon learning of the Board of Education's action the students of the College of Applied Science held a meeting to discuss the question thoroughly and decide what action, if any, should be taken in order to retain their college at the University. Notably free from sensational addresses and condemnation of the state board and university officials, the meeting was concluded by the appointment of two committees, one to draw up resolutions embodying the stand taken by the engineers and the other to take charge of a university student mass meeting, scheduled for the evening of October eleventh.

The efforts of the two committees were manifest as the mass meeting program was unfolded. With unity of sentiment over twelve hundred students and friends of engineering representing all colleges of the University, assembled in one of the most enthusiastic mass meetings ever held in Iowa City. Mr. Benjamin Boer, President of the Associated Students of Applied Science, presided and said:

There is not a single engineer at Iowa that will ever attend Ames. It is not a matter
of moving the equipment. It is also destroy-
ing the integrity of the university and is
the moving of an essential part of the uni-
versity. The college of engineering is a
necessity to Iowa and the engineers need your
support. 107

The almost unanimous student support of the engineers
apparent from the beginning became more certain as
representatives from the different colleges voiced their
opinions and addressed the assembly. Characteristic
of the sentiment expressed by each was that of Carl
Burnside, student of the College of Pharmacy. Mr. Burn-
side stated that though his college was small it was
ready "to fight and fight hard for the engineers and all
of the University." In concluding his talk he declared,
"We want the engineers and we want them bad."

That all might know more definitely the
sentiment of the engineers Benjamin F. Boer, President
of the Associated Students of Applied Science, read the
following resolutions already unanimously adopted by
his organization. Indicative of serious study and
consideration, in regard to the question, they de-
clared:

Whereas, After a close perusal and a care-
ful weighing of the arguments set forth by the
State Board of Education in support of their
recent action relative to the two colleges of
engineering in the State of Iowa, we, the
Engineering students of the State University
of Iowa have reached the following conclusions:
That the Board of Education is not cognizant of the scope of the Engineering profession.

That they have not given full consideration to the question of duplications; and

That their action endeavoring to deprive the State University of Iowa of its Engineering College is a wrong solution of the problem involved.

We fully agree with the Board of Education that it is an indefensible act for the State of Iowa to maintain two complete colleges of Engineering, such as we now have. The question then becomes:

Shall the college of engineering of this state be located at Ames, or at the State University?

We quote from the report of the Board of Education:

"The facilities for professional training in education are thoroughly established at the University, and by comparatively slight increase in expenditure will be adequate to supply the entire demand."

This statement was made with particular reference to the courses at the Iowa State Teachers' College. The Board, therefore seems to overlook the fact that Engineering is a profession, and as such should be embodied in the courses at the University. Engineering has nothing in common with agriculture; it is not a trade in any sense of the word; but it requires of its members such professional and cultural training as can be obtained only at a university. 111

After pointing out in a clear and logical fashion the weaknesses of the Board's arguments to justify its action, attention was called to the fact that:

The Board further states in support of its action that "Naturally this work (referring to Engineering at Ames) will necessitate certain duplications in mathematics, in English, in
modern languages, and in economics." The Board 
forgets necessary duplications in physics, in 
chemistry, and in the departments of geology and 
natural science. These are as important as any 
named by the Board. The University offers such 
opportunities in physics, in chemistry, and in 
natural science which cannot be duplicated with­
out great expense. Our physics department is 
particularly equipped for Engineering work; in 
fact, the present status of the elementary courses 
and the advanced electrical courses in physics at 
the University is due largely to the department of 
Engineering. In the event of a forestry course 
which must at some time be comprised in the college 
of Engineering, no such opportunities can be advanced 
for its instruction as at the University, because of 
its geology and natural science departments with 
their co-related museums and laboratories.

A further argument may be advanced with 
respect to duplications:

The time is not far distant when the Engineer­
ing profession at Iowa will require five, or even 
six years for completion. Many other states have 
already taken this step with respect to their 
Engineering colleges. Iowa, in order to compete with 
the rest, must make the same requirement. The pur­
pose of the extra time thus gained is not to increase 
the technical training, but to give the Engineer­
ing students the more cultural education which the 
demands of the profession now require. What, then, 
can be the advantage in concentrating the Engineer­
ing departments at the Agricultural college, when 
the purpose of the Board, as stated in its report, 
is to place the liberal arts work at the University? 
There can be no gain by such a step; on the con­
trary, the Engineering students of Iowa would lose 
great advantage which comes to them through 
general and particular contact with the departments 
of the State University. The physics, the natural 
sciences, and the general arts of the State Univer­
sity are all adapted for advanced and for graduate 
work in Engineering, and can be obtained only at 
the University.

With a sincere conviction that members of the 
Board of Education had misjudged and consequently offered 
the wrong solution to the problem which confronted them,
the engineers, by way of their resolutions asserted:

The Board of Education is taking a definite retrogressive step. School men and the laity have for the past twenty-five years been clamoring against the narrowing and professionalistic tendencies of the various colleges. The remedy for this evil has been worked out by all the great universities of this country, and in brief is this: Increased importance has been placed upon cultural studies in the professional courses, and also upon the contact with men pursuing the general arts. A very striking illustration of this may be found in what is called the model state university of this country, the University of Wisconsin, where the policy has been to inject more and more broadening courses. By reason of the strength of its curriculum, a very great percentage of students have voluntarily adopted the five year course.

Those who are inclined to look with favor upon the action of our Board of Education in Iowa, will say that President Van Hise of the University of Wisconsin, favors that action. But let us consider what alternative the president had presented to him, and perhaps his action can be better explained. From his words it is not unreasonable to presume, it may-even be taken for a fact, that the president acted under the idea that a complete Engineering college must be maintained at Ames, regardless of the conditions at the State University. Reasoning from this premise, we grant that the president's conclusion would be correct, but in the fact of fact the premise is wholly false and sophistical.

The Board of Education wishes to undo the work of over fifty years of building up an Engineering college within reach of cultural training, and to place us under the system which was in vogue before the reformation of professional education; that is to return our professional schools to the position of mere trade schools, and to turn out not Engineers, but tradesmen in Engineering.

Therefore, relying upon the above arguments, be it

Resolved, That the action of the State Board of Education is hasty, immature, uncalled for, and
is one that will result in the weakening of the efficiency of higher education in the state of Iowa; and further be it

Resolved, That we, the students of Engineering at Iowa, protest against this action and demand its reconsideration. Be it

Resolved, That because of the close interconnection of the pursuit of Engineering with the welfare of the other departments of this University, we ask the hearty co-operation of all students and alumni of all the departments of the University, and of the people of the state of Iowa, to aid us in this protest and demand and thus retain the complete and balanced institution of learning which we now have; and to prevent the sapping of its energies which would destroy its position of efficiency in the state and in the union. It is further

Resolved, That these resolutions be sent to the newspapers of Iowa for publication, and a copy thereof be presented to each member of the Iowa State Board of Education.

Unanimously adopted this 11th day of October, 1912, by the Associated Students of the College of Applied Science at the State University of Iowa.

The resolutions signed by Benjamin Boer, President, and A. N. Hanson Secretary of the Associated Students of Applied Science created a profound impression, not only upon the members of the assembly to whom they were read, but also upon those to whom copies were mailed. Described as having answered the conclusions reached by the Board of Education with convincing clearness and earnest logic, they presented a far sighted argument reputed as "one which will stand upon its own feet." That they expressed the sentiment of the profession and were not merely trumped up phrases for sake
of argument may be gathered from a statement made by Professor George O. Whipple, a most eminent authority on sanitary engineering. In an address delivered before the International Congress of Hygiene and Demography at Washington, on September 25, 1912, the Harvard Professor, declared,

Engineering is fast coming to be regarded as one of the learned professions, and the education required of one who enters this profession must be not only scientific and technical but broad and humanitarian. He must not only know the underlying principles of the mechanical sciences but if he is to become the director of great enterprises he must have the power to think logically and reach conclusions quickly, write clearly and speak forcibly - not to mention such moral qualities as honesty, enthusiasm, and that vague something called 'personal magnetism'. Some of these qualities are inherent in the individual, but the powers to think and speak and write can be acquired by study and practice. It is partly because of this need for broad-minded engineers and partly because science itself is becoming so broad and its branches so interwoven that the applied sciences are being taught more and more as graduate courses in our universities and that the technical schools are looking forward to longer courses than the usual period of four years.

Unmoved by the excellence and potency of the arguments presented in the resolutions adopted by the Associated Students of Applied Science and ratified by practically all university students Senator A. B. Bunk of Spirit Lake, and Board Member O. H. Brenton of Dallas Center, in a letter to Benjamin Boer indicated that the action of the board was final and no change
in the decision would be made. Confronted with such finality, increased organization and further protest seemed imperative if engineering was to be retained at the University. Headquarters, therefore, were established in the College of Applied Science and under the supervision of the Associated Student's work was directed.

Lest it be defeated in its purpose the Greater University Committee, under the leadership of its President, Paul Cosgrove, very early, took a definite stand in opposition to the action of the Board of Education. At a special meeting, on October 30, a sub-committee of the same organization, headed by Robert A. Fenton, of the Dental College offered a plan of action, which called for the organization of a Students Central Committee. Considered a movement in the right direction and one that would eliminate the existing lack of centralization among the students, the plan was adopted. Composed of representatives from all the colleges of the university as well as representatives from both the Alumni and Women's organizations, the Central Committee promptly discussed its objectives and the methods by which they might be achieved. The first task was to acquaint the students with the problem, arouse their enthusiasm and raise funds to defray the expenses of a definite and organized plan of action. Attracted by the results of a mass
meeting held at Ames, and during which, two thousand
dollars were collected, the Committee planned a
General Mass meeting in Iowa City. Although the
mass meeting was used as a means to arouse student
enthusiasm, it was decided to raise funds by an organized
campaign executed through the sale of "tags." For
three days starting November 20, tags were sold for twenty-
five cents or more. The Iowa City Republican, comment-
ing on the mass meeting and "tag day" venture, made
the following statement.

This is "tag day" for the engineers, and the
whole university is helping to raise funds to
save the college. One co-ed gave $25, and
other contributions range from that figure
down to twenty-five cents. Students will be
tagged Thursday and Friday also, and a large
sum for effective work should be realized.

The mass meeting last night was remark-
able for its enthusiasm and there was a solid
sentiment of loyalty from all departments.130

That the money raised might be used most ef-
ficiently in educating, the state of Iowa and the legis-
lature in particular, engineering properly belonged at
the University, a sub-committee was appointed to prepare
a bulletin and get a lively publicity campaign under way.

Special effort was made to obtain publicity in the state
newspapers, in order that people in all parts of the state
might become thoroughly acquainted with the question and
properly prepared to give their support in fighting the
proposition when it would come before the legislature.
The bulletin, prepared under the direction of the subcommittee, appeared, in late November and was entitled, *A Plain Statement of Facts,* with regard to the Engineering situation at the State University of Iowa. Illustrated with the various buildings devoted to engineering and classroom scenes, showing the engineering students at work, the bulletin, from an educational point of view, contained an extensive and sound argument against the removal of engineering from the University. Interesting and enlightening, especially when considered in connection with the estimated value, made by the Board of Regents, was the comparative analysis of the engineering investment at the two schools. The Engineering investment at the University of Iowa was estimated as follows:

<table>
<thead>
<tr>
<th>Building</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Building</td>
<td>$126,915.12</td>
</tr>
<tr>
<td>Steam Laboratory</td>
<td>10,000.00</td>
</tr>
<tr>
<td>Engineering Shops</td>
<td>20,000.00</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>27,000.00</td>
</tr>
</tbody>
</table>

**Equipment:**

- Mechanical Engineering and Shops... 19,715.00
- Electrical Engineering.............. 10,722.34
- Civil Engineering.......................... 5,000.00
- Mining Engineering..................... 1,850.00
- Descriptive Geometry and Drawing... 250.00
- General Equipment and Furniture..... 5,344.98
- Hydro-Electric Plant.................... 37,000.00

**Total........................................ 326,798.66**

At the Iowa State College of Agriculture and Mechanics Arts the estimated investment amounting to but little more, was
Engineering Hall............ $146,250.00*
Engineering Laboratory........ 25,000.00
Carpenter Shop................ 7,000.00
Forge Shop.................... 5,000.00
Foundry........................ 5,000.00
Machine Shop................... 18,000.00
Engineering Experiment Station... 2,694.12

Equipment:

Civil Engineering.............. 11,050.31
Electrical Engineering........ 15,286.24
Engineering Dean's Office..... 529.20
Mechanical Engineering........ 45,654.19
Mining Engineering............ 13,375.10
Furniture (Approximate)....... 19,000.00

Total.......................... $312,699.16

*The complete investment for the Engineering Hall is $195,000 but approximately one fourth of the building is devoted to the department of physics. 139

Mailed to university alumni residing in the state, newspaper editors, and members of the legislature, the bulletin received wide publicity. Very soon, however, to contradict the Iowa State College figures, engineering students at that school issued an engineering circular charging that people at the University under valued engineering at Ames in an effort to mislead the people of Iowa. The compilers of the circular specifically stated that insofar as moving either of the engineering schools was concerned there was no anxiety to bring the university engineering college to Ames in accordance with the decision of the State Board of Education.

Intent upon securing the support of not only alumni as individuals and men's organizations the Students
Central Committee arranged to capture the support of women and their organizations. This objective was in part achieved by having a member of the engineering college appear before the Iowa Women's Club at the home of Mrs. Waldron, in Iowa City. Following a forceful and convincing talk on "Why the College of Engineering Should be retained at the State University," the Club decided to use its influence to help retain the College. This decision was followed by the appointment of a committee to frame resolutions to be presented to the federated clubs of the state in order that the action in support of the engineers might be brought to the attention of the state legislature. In addition, to enlisting the "Women's Club" support, the Central Committee planned and succeeded in organizing permanent county organizations among the university men and women throughout the state. With an unmistakable boldness and precision it was stated, at the very beginning, that the purpose of the county organizations was to assist the engineers in their fight against the action of the Board of Education. Already aroused by the attempt to disestablish engineering and thereby dismember the University, alumni quickly responded to the idea and began to hold meetings in the different counties. In almost every instance before the meetings adjourned, resolutions upholding the engineers at the University
adopted. The enthusiasm, solidarity and determination of the alumni throughout the state gave encouragement to the members of the Alumni Board, who early in July began to prepare for the almost inevitable fight.

By correspondence, members of the alumni board, which was composed of, W. O. Finkbine of Des Moines, Carl F. Kuehnle of Denison, W. T. Shepherd of Atlantic, J. J. McConnell of Cedar Rapids, and Euclid Sanders of Iowa City, had expressed their attitude towards the reorganization of the schools and the disestablishment of engineering. In a letter to, Irving E. Brant, managing editor of the Iowa City Republican, Mr. Lovell wrote:

I think everyone believes that Engineering ought to remain at the University. Iowa ought like other states, to have a University and an Agricultural School. Ames is missing a great opportunity in failing to do for Iowa what Agricultural Schools are doing for their respective states. In one sense Iowa has no Agricultural School.

You suggest three plans of action. One—letting events take their course. Two—A fight in the legislature. Three—an appeal to the courts.

It was the opinion, at this time, of Mr. Lovell and Mr. Finkbine that an appeal should be made to the courts. Mr. McConnell, however, believed that events should be allowed to take their course without interference. To all it was considered the wiser policy "to proceed slowly but none the less positively" to determine the
real status and the implications involved. Unfortunately, from the viewpoint of the alumni actively interested and eager to work, President Bowman gave neither leadership nor strong support. The belief, by members of the alumni board, that while desiring to retain engineering, the President, would nevertheless be satisfied to give it up in exchange for the upper two years of State Teachers College and domestic science from the State College of Agriculture and Mechanic Arts, was strengthened when he advised that "no attempt to interfere with the action of the Board" should be made. Proposing on the other hand, "to do everything in their power to nullify the action" of the Board of Education, in an effort "to preserve what they believed to be the integrity of the University," the alumni not only disregard the advice of President but even neglected to consult him in their endeavors.

Convinced that an appeal to the courts "would be the easiest, cleanest, safest and most conclusive way to handle the matter" and should be made if there was a "leg to stand on," the question was submitted to several competent attorneys for an opinion in regard to the legality of the Board's action. Chief among those from whom an opinion was sought were Mr. Milton Remley, Professor E. A. Wilcox of the University's Law College and the Honorable Frederick Lehmann of St. Louis, late
President of the American Bar Association and Solicitor General of the United States.

The opinion of attorneys having been requested the members of the alumni board held a meeting in Iowa City on October 26, to discuss the matter. Because legal opinions had not yet been received no definite or final conclusions were reached other than that all members, except Mr. J. J. McConnell, were opposed to the Board's action. Following the meeting an answer to the statement made by the Board of Education in defense of their action was prepared. Signed by Messrs. Finkbine, Sanders, Kushme and Shepherd it not only answered the defense but gave much additional information. Alleging flaws in the arguments of the defense they declared:

The defense states that an effort was made to see if the institutions themselves could contribute towards the solution of the problem. A committee of fifteen consisting of five members from each of the faculties was appointed to consider several matters, having in mind closer relations between the three institutions. From this committee of fifteen a sub-committee of three on functions was chosen. This sub-committee alone among the several sub-committees appointed never made a report. Presumably each member looked at the matter from a different viewpoint and they were unable to come to any agreement.

Inquiry of the Chairman of the sub-committee on functions discloses the following facts. The committee had one meeting at which two of its members were present throughout and one for a short time. Following the ideas brought out in this meeting the Chairman formulated two reports, one of which he was sure the committee could agree
upon and the other presenting what he thought

upon and the other presenting what he thought
to be an ideal solution which could not be reached
but which might be approximated to, and possibly,
with some alterations necessary to make it con-
form to existing laws and conditions, would be
such as might meet the approval of the committee.
The Chairman consulted with the President of the
finance committee and was by him advised to
postpone action of the committee to a future
period not named. Since advising that the com-
mittee postpone action, the Chairman of the
finance committee has never again suggested further
action. The subsequent appointment of a presi-
dent for the University, who was supposed to have
the confidence of the Board, and the probable
early appointment of a president for the Agri-
cultural College, to whom in conjunction with
President Beerley of Cedar Falls the chairman of
the sub-committee felt that the Board should look
for a solution of this problem, made it seem unwise
to him to call for further action by the committee.

Again the defense says:

We do not believe that anyone would serious-
ly contend that a state is justified in keeping
up within 125 miles of each other two engineering
schools.

In answer to this it may be said that there
are many people who do contend and seriously con-
tend that the state is justified in maintaining
engineering at Ames and at the State University,
at both of which places it has been developed to
such a degree that to destroy it at either place
would do much greater harm than could possibly be
offset by the relatively petty saving in money that
would result from the consolidation of engineering
at one school. There are localities in this country
where there are several engineering schools within
a radius or diameter of 125 miles and one in which
there are two such schools on practically the same
campus. Of course these same demand that exists
for these other schools may not apply to Iowa
since the defense says:

"The state of Iowa is not particularly inter-
ested in this branch of education,"
and quotes Dr. Pritchett to sustain this point. Perhaps Iowa is not interested in engineering education, but the fact that there are more young men pursuing this branch in state supported schools in the state of Iowa than there are pursuing any other one branch even including the large College of Liberal Arts, would seem to be in itself a sufficient answer to this contention that Iowa is not particularly interested in engineering education. It may be said also that neither Iowa, nor any other state, is maintaining schools of higher learning simply to provide workmen to do the work of the state, but these schools are maintained to train the youth of the state, each in the particular field in which he is best adapted to serve as one unit in the development of human progress and civilization.

That colleges of engineering are expensive to equip and maintain, as stated by the defense, and that new and expensive apparatus must be continually supplied is entirely true, but this is no argument, because all education costs and there is no means of comparing the worth of the output, the educated man, with the cost of producing him, and, if efficiency be taken into consideration, it can be shown that no great economy results from the maintenance of one school with very large attendance rather than the maintenance of two schools of moderate attendance. Who is there that shall be found to say that this efficiency is not worth what it costs?

In the next statement of the defense concerning the advantage of Ames with respect to age, equipment, number of student body, and impression it has made upon the state, are mis-statements that need not have occurred if a little more careful study had been given to this question, and some of the points will be seriously disputed.

With respect to age, engineering was taught in the State University before Ames was thought of. It is true that the work done was elementary but so was practically all of the engineering work that was taught in the western colleges at that time. In many of the state universities, and indeed at Iowa State College, engineering was not in the early days set aside or dignified by being organized in separate colleges. It was maintained as a department of the general college which was called by
different names in the different states and in
Iowa was known simply as the College or Collegiate
Department. A chair of engineering was first
established in both schools the same year, namely
1873. The early work in engineering at the State
University was of collegiate grade as collegiate
was then understood, and it has always been of
collegiate grade with full college entrance require-
ments for admission. The work at Ames was begun
in 1869 instead of 1862, as stated by the finance
committee in its report to the Board of Education,
(and it should be noted that there was no building
ready and no course offered before 1869, but that
the college was opened on the 17th of March, 1869),
and in the beginning and for a good many years the
sole requirements for admission to the College at
Ames comprised work taught in the grammar schools,
and, indeed, not until within six or eight years
has a full four year high school course been nece-
sary for admission to the State College. No
wonder, therefore, that one statement is true,
namely, that there is a much larger student attendance
at Ames than at Iowa. It is true that there was no
real College of Applied Science in 1903 and there
had been for very many years a very active department
of engineering within the College of Liberal Arts,
a department whose work resulted in the degree of
Civil Engineer or Bachelor of Science in Civil Engi-
neering, or Bachelor of Science in Electrical Engi-
neering, and which points with pride to its gradu-
ates of the late 70's and early 80's no less than
to those of the College of Applied Science who are
making phenomenal progress in the ranks of their
profession.

Excluding the agricultural engineering equip-
ment and building at Ames, an equipment and building
which was until lately known as farm machinery and
pavilion, which is credited to the Division of Agri-
culture, and concerning which there is no question,
it being admitted by everyone that this equipment
and the so-called course in agricultural engineering
belongs to Ames, it is not true that the equipment
is more than double that of the University and
indeed it is very far from true, the actual differ-
ence being in the neighborhood of $50,000 in favor
of Ames as can be shown by reference to the state-
ments of property and equipment now appearing on
the books of the two institutions. Ames has had within a few years 800 or more students of engineering and it is probably no fault of the school that it now has only about 500 and is still falling off in attendance, while the State University has never had more than 250 students in engineering, and also through no fault of its own lost in attendance for two or three years but has this year begun to increase again with a freshman class for the current year, more than 80% in excess of that of the last school year, so that, while the statement of the defense is inaccurate, it is approximately true, for there are about three times as many students in engineering at Ames as there are at the State University, a fact that has been largely explained by what has preceded concerning low entrance requirements.

That the State College touches the industrial and commercial life of the state as the institution at the University does not is without doubt true and without doubt ought to be true, for in reaching out to the industrial and commercial life of the state, the State College is doing exactly what it was established to do, and the concrete example cited on the petition of the Iowa Manufacturers Association loses none of its force when it is known that this petition is the result of a suggestion of the Ames authorities to the Manufacturers Association because, whether the initiative was with the State College or in the Manufacturers Association, the work that the petition seeks to have done is the work of the State College and not of the University. It is, of course, a little unkind in the light of these facts and with the intention of belittling the institution to say that the Manufacturers never thought of the College at the University. This is not to say that the College at the University is of no benefit to the manufacturing and industrial interests of the state or has no connection with them. On the contrary tests and discoveries made in its laboratories have been of immense value to the state and will always continue to be, and while the University might very well interest itself in the elementary education of the workers in the various industrial establishments of the state were it not for the existence of the State College, to do so under present conditions would be distinctly trespassing on the field of the State College, and
the University has never attempted to do any work that any reasonably minded citizen of the state could possibly say was not clearly within its function. But it should also be said in this connection that the University sought authority and funds from the General Assembly four years ago to conduct extension work that would widen its sphere of usefulness to the people of the state, and was given authority but no funds.

That the Board was forced by the logic of conditions to decide to discontinue the engineering work at the University and concentrate it at the State College of Agriculture and Mechanic Arts may well be doubted. The logic of the situation does not point to any such arrangement. The logic of the situation does not necessarily point to the concentration of engineering at either school. It might be said that in the beginning of things the logical place for engineering was at the University, and there only, and that it was the intent of those who established the State College to make it distinctly a lower grade school than the University. But that time has passed. The state has elected to establish and equip two great schools of engineering. They have somewhat different aims. The lines emphasized will be different in the two schools and it seems to be altogether probable that the logic of the situation points to the continuance of these two schools and their development along certain differentiated lines which the Board of Education might do well to study.

The fact that the majority of engineers graduated in Iowa have to seek a field of labor outside the state is no indication that the state does not need these engineers, for it may be asserted without fear of sustained contradiction that the state is today throwing away hundreds of thousands of dollars because it is not entrusting to these same engineers the work that the state has educated them to do. But even if there were no such work to be done in sufficient quantity to occupy all of the youth who seem to be fitted for this pursuit, who could say that one of the two or three leading professions of modern times shall be represented on the educational system of the state of Iowa by anything less than the highest and best course of
training that can be given, and who would say
with Dr. Pritchett that we have no need of train-
ing engineers in this state because it is an agri-
cultural state all around us? No more can these be
found that can be found those to say that there is
no need of training lawyers or of giving higher
education to any of our youth because this is an
agricultural state and there are plenty of univer-
sities and law schools in the neighboring states
about us.

The defense of the Board further says,

"the statement that a real college
of engineering cannot exist outside of a
University and that a emasculated is not
supported by the facts."

This may be true but the schools cited as
examples by the defense are perhaps unfortunate.
The Massachusetts Institute of Technology is to
all intents and purposes a technical university.
In addition to its courses in engineering, it
gives full four year courses in architecture, in
chemistry, in biology, in physics, in geology, in
general science, and in naval architecture, and
while it does not offer Latin or Greek, it does
maintain departments of university grade in all
of the general sciences, in economics, in history,
and modern languages. It conducts a graduate
school and offers the degrees of Master of Sciences,
Doctor of Philosophy, and Doctor of Engineering.
The Troy Polytechnic, it is true, is a narrowly
technical school although it does maintain a general
science course in addition to its course in engi-
neering. It has no graduate department. From the
very age of the school (it was the first engineer-
ing school to be established in this country) and
its large number of graduates it has always been
recognized as a strong school, and yet it has been
passed in reputation by the Massachusetts Institute
of Technology, which was not established until after
the Civil War, and has been so passed largely by
reason of the great development of the general
sciences that has made this institution essential-
ly a technical university. The "institution at
Bethlehem", known as the Lehigh University, is in
every respect a university and in addition to its
engineering courses offers a classical course and
a Latin-scientific course, although it was established chiefly for the purpose of training the young men of the Lehigh Valley in the pursuits of that region. It is fair to say that there are but two universities of any standing in this country which are without departments of engineering, and in both of these institutions the fact is regretted.

No one could desire to detract in any way from the good name of the engineering school at Ames. It has had many graduates and it would be strange indeed if a few of these had not risen to notable positions in the profession. Engineers are born and not made by any school. The number who become noted in this profession is very small when compared with the number engaged in the profession, but this may be said to be true of every profession, and it makes no difference whether the young man started with a grammar school education to study engineering, or whether he was self-taught, or whether he started with full college entrance requirements, if he had it in him to succeed, success was certain. But no one shall say that in these days when the engineer is a leader in the world's work, is no longer confined to the frontier camp, but sits in the councils of the mighty in the business affairs of the country, he is not entitled to the broadest education that the state can give.

The defense asks what alternative the University proposes. So far as is known the University does not propose any alternative. It has not been asked to propose an alternative. It certainly would not propose to deprive Ames of anything that belongs to it or that it has developed to a high degree of efficiency whether or not it was a part of the work originally contemplated as the function of that school. But certainly the fact that agricultural students in agricultural colleges are increasing by leaps and bounds has nothing whatever to do with the question of where engineering shall be located.

It is not for the University to say whether a "status quo" shall be maintained. The State Board of Education may have been created to correlate the work of the three so-called schools of higher education. It is not clear from the act that they were appointed for this purpose, but is claimed in the defense that his fact is indicated by the reports of committees,
and it may be accepted. The friends of the University are heard to say simply that the correlation proposed is an improper one, and they ask that the matter be reopened and reconsidered, that the authorities, of the several schools be invited into consultation in the belief that in the combined wisdom of the people near enough to the problem to know its elements and their relative values will be found counsel worth full as much as that of the so-called educational experts who with one exception have but the merest smattering of knowledge of the actual situation in Iowa and who, as indicated by their letters, have not given the subject the thought that its importance warrants.

The answer to the "Defense" was both logical and sound not as positive perhaps as it might have been but nevertheless sufficiently positive to indicate that the Alumni were convinced they had a case and meant to take action.

The convictions of those opposing the Board of Education's actions were strengthened by the legal opinions received from reliable authorities. Opinions were unanimous to the effect that the College of Applied Science could not legally be removed from the University and established elsewhere.

Reporting the opinion of Professor Wilcox, given after examining the abstract of the laws, particularly the chapters repealed by the law, of 1909, creating the Board of Education and those that were not repealed Dean Raymond in a letter to Mr. J. B. Weaver of Des Moines wrote:

1. The Board cannot do by indirectness what the constitution of the law prohibits it from
doing directly. If it is shown that engineering was contemplated as an essential department of the University at the time the constitution was adopted or if it can be shown that it is accepted in general as an essential feature of a University, it is probable that the court would hold that the discontinuance of a long established course in engineering at another place in the state would amount to doing indirectly what the constitution says shall not be done.

2. The organic act provides that the varied applications of science shall be taught at the University. The various branches of engineering constitute such varied applications or an essential part of them. The demand for this instruction is demonstrated by the presence of 160 to 170 students pursuing it, who may demand that the Board of Education shall provide this instruction at the University as provided by law.

3. In the laws of 1904 the legislature appropriated $50,000 specifically for an engineering building and $10,000 for a dam and power house on a site donated to the University for the development of the School of Applied Science. It is doubtful if the Board of Education can divert to other uses a building provided by the legislature specifically for engineering. The Board has power to manage the properties entrusted to its care and probably succeeds to the power of the Board of Regents, not repealed, to establish "such other departments, courses of study, etc." which power may have been supposed to carry with it the power to discontinue various departments or courses of study for good reason. But the law probably does not give the Board power to discontinue those branches provided by law to be taught in the University and for which there is a definite and reasonable demand even though it provides instruction in these branches at other places.

In similar manner the Honorable Frederick W. Lehmann gave his opinion as to the legality of the Board of Education's action in discontinuing the College of Applied Science at the University and establishing it at the State College of Agriculture and Mechanic Arts.
a letter to Arthur J. Cox of Iowa City, on November 
20, 1912, he wrote:

I have examined the question and conclude 
that it cannot be done without disregard 
alone of the constitution and statutes of 
Iowa.

The acts of Congress granting two 
townships of land to the State for the 
use of a University did not undertake to 
define the institution which was to be the 
beneficiary of the grant further than was 
done by the use of the general term Uni-
versity, but left all the particulars to be 
determined by the proper authorities of the 
state.

Pursuant to the acts of Congress, the 
Constitution of the State adopted in 1846 
provided by Art. 10, Sec. 5, that,

"The general Assembly shall take 
measures for the protection, improve-
ment or other disposition of such 
lands as have been, or may hereafter 
be reserved or granted by the United 
States or any person or persons to 
this State for the use of a Univer-
sity and the funds accruing from the 
lands or the sale of the lands or any 
other source for the purposes aforesaid, 
shall be applied to the support of said 
university with such branches as the 
public convenience may hereafter demand 
for the promotion of literature, arts 
and sciences."

Here is something in the way of definition. 
The University is to be an institution of learn-
ing, dedicated to literature and the arts and 
sciences. And under this provision of the 
Constitution the University might consist of a 
central institution WITH BRANCHES IN DIFFERENT 
PARTS OF THE STATE" as the public convenience 
may hereafter demand."

Consequently with the constitution the legis-
lature by act approved February 25, 1847, estab-
lished at Iowa City "an institution to be called
the State University of Iowa," and subsequently, I am informed, branches were established at Fairfield, Keokuk and Dubuque.

A new constitution was adopted by the State in 1857, and by this new and radically different policy as to the State University was determined upon.

ART. 9, SEC. 11, provides that, "The State University shall be established at one place WITHOUT BRANCHES AT ANY OTHER PLACE and the University funds shall be applied to that institution and no other."

The "one place" was determined by Article 11, Sec. 8, which provides, that

"The seat of government is hereby permanently established as now fixed by law in the City of Des Moines, in the County of Polk, and the State University at Iowa City, in the County of Johnson."

Section eleven of article nine by its plain language precludes more than one State University. And the one institution must have one fixed place without branches at any other place. The wisdom of this constitutional provision is not open to question by any one, save by the people of the state acting in their primary capacity, by way of amending the Constitution or adopting a new Constitution.

There was, however, no definition in the Constitution itself of the word "University", and it must be taken to have been used in its accepted popular sense. And so it has been construed by the legislative and administrative branches of the State government from the beginning to the present time. A rule of construction of the Constitution observed without breach, from the adoption of the Constitution for fifty-five years, by all those having occasion to act under its provisions is the very highest evidence of the intention of the framers of that instrument and of the people in ratifying it.

The Board of Education, a QUASI legislative
body provided for by the same Articles of the Constitution, enacted in 1858, that,

"The object of the State University of Iowa, ESTABLISHED BY THE CONSTITUTION AT IOWA CITY, shall be to provide the best and most efficient means of imparting to the youth of the state, of both sexes, upon equal terms, a thorough education and a perfect knowledge of the different branches of literature, THE ARTS AND SCIENCES, WITH THEIR VARIED applications."

This is not merely a declaration by the Board of Education of their sense of what a University should be, but a declaration of their view of the nature of the institution which had been established by the Constitution at Iowa City.

The Board of Education further enacted, that,

"There shall be ATTACHED TO THE UNIVERSITY A COLLEGIATE DEPARTMENT, in which as soon as may be deemed expedient by the board of trustees hereinafter provided, regular college classes shall be formed or provided for, and a president and the necessary professors and tutors elected. There shall also be a normal department of the university, in which shall be taught the theory and practice of teaching and everything which enters into it as an art, including all the most improved methods and processes now in use in all the varieties of teaching."

Here is recognized a difference between a college and a university, and that while a university may properly include a college, it is something more and higher than a college, and may as is the case with the German Universities and with Johns Hopkins in this country, begin its work where the college leaves off.

The above enactments of the Board of Education were approved and adopted by the legislature of Iowa and appear as sections 1926 and 1927 of the Revision of 1860.

Chapter 87 of the Acts of 1870 repeats the
description of the State University, varying the language used, and going into more detail, but in no way altering the sense. Section 1 of the act prescribes,

"That the objects of the State University established by the Constitution of Iowa, shall be to provide the best and most efficient means of imparting to young men and young women on equal terms a liberal education and thorough knowledge of the different branches of literature, the Arts and Sciences with their varied applications. The University, so far as practicable, shall begin the courses of study, in its collegiate and scientific departments, at the point where the same are completed in high schools; and no students shall be admitted who have not previously completed the elementary studies in such branches as are taught in the common schools throughout the State."

This was continued substantially as section 1585 of the Code of 1873 and as section 2640 of the Code of 1897 and is the law of Iowa today and remains as well the present day legislative interpretation of the Constitution.

The administration of the University was at all times consonant with this view of what a University should be, and its different courses, departments and colleges as the institution developed were determined accordingly. Engineering was first adopted as a course of study, then established as a department and more recently as the College of Applied Science. And it cannot be doubted that this School of Applied Science is as much an integral part of the University such as the framers of the Constitution intended the institution at Iowa City to be, as is the School of Law or that of Medicine. And the legislature of the state has from time to time by specific designation in its appropriation bills recognized instruction in engineering to be as legitimate a function of the University as instruction in Law or Medicine.

It is not intended to suggest that instruction appropriate to a University course may not be given at other schools of the state. The utmost latitude is to be allowed in this respect. Courses in literature and history, proper in a University, might have
as proper place as part of a comprehensive
plan of instruction in the Iowa State Teachers' College at Cedar Falls. Certain branches of the
law might be studied to advantage by the students
of the Agricultural College at Ames, sanitation,
hygiene and other subjects related to medical
science may be taught in the high schools as
appropriate to a general plan of public education.
There is no occasion to attempt to determine the
extent of legislative authority in this respect.
It is plain, however, that when law and medicine
and engineering are taught at other schools of the
State, not simply as incidents to the distinctive
purpose for which those other schools were founded,
but as entirely independent courses, and the Univer-
sity at Iowa City is stripped of them, then branches
of the University are established at other places
and the University at Iowa City is dismantled. If
this can be done with one of the departments or
schools of the University it can be done with all
of them and the Constitution of the State nullified
altogether, for the State University would no longer
be established at Iowa City without branches at any
other place.

The present State Board of Education in the
draft of their report submitted by you recognize that
their proposals for the future government of the Uni-
versity, the Agricultural College and the Teachers'
College involve a radical departure from the previous
policy of the State, which the Board declares to be
a mistaken one. The report says:

"Are the institutions to continue practical-
ly as they have been in the past, separate
institutions, each conducting its work
without any special thought of the other,
or shall the Board undertake to explicitly
define the function of each TO THE END THAT
THEY MAY IN REALITY CONSTITUTE WHAT WILL BE
TO ALL INTENTS AND PURPOSES A SINGLE INSTITU-
TION?"

The wisdom of this proposed plan is not for
me to consider, but it is obvious that if the Univer-
sity, the Agricultural College and the Teachers'
College are made "what will be to all intents and
purposes" a State University "established at one place without branches at any other place," but an institution consisting of three branches, each branch located at a place separate from the others.

Is this plan of the Board in accordance with the intent of the Constitution? I think not, and the Board itself is evidently of the same opinion and so states by implication, for it says, "other states wiser than our own it would now seem elected to do this from the beginning." The meaning of the Constitution, its intent, is a matter for interpretation and therefore for discussion by those acting under it, but its wisdom is not. When administering office under the Constitution we must take it as it is, even though we may not believe it to be as wise in its provisions as the Constitution of some other state. Its wisdom is to be challenged only by proposed amendment to be effected in the prescribed manner. What the Board of Education is now proposing to do can properly be done only under sanction of an amendment to the Constitution which will put Iowa in line with "other states wiser than our own," if so be it, other states are wiser in this regard.

The Board is apparently of opinion that its proposals are sanctioned and even required by the act of the Iowa legislature which called it into being. But the legislature no more than the Board may disregard the Constitution. I do not, however, so read the act, which is Chap. 170 of the Acts of the Thirty-third General Assembly.

Section 1 of this act provides that

"The State University, the College of Agriculture, and Mechanic Arts including the agricultural experiment station and the Normal school at Cedar Falls shall be governed by a State Board of Education consisting of nine members and not more than five of the members shall be of the same political party. Not more than three alumni of the above institutions and but one alumnus from each institution may be members of this Board at one time."

This takes the institutions as they are and
provides for no radical change in their character. It does not authorize a consolidation nor dispense with nor modify the Constitutional provision that "the State University shall be established at one place without branches at any other place."

Section 4, defines the powers and duties of the Board and provides, that

"The State Board of Education shall have power to elect a president from their number, a president and treasurer for each of said educational institutions, and professors, instructors, officers and employees; to fix the compensation to be paid to such officers and employees; to make rules and regulations for the government of said schools not inconsistent with the laws of the state; to manage and control the property both real and personal, belonging to said educational institutions; to execute trusts or other obligations now or hereafter committed to the institutions; to direct the expenditure of all appropriations the general assembly shall, from time to time, make to said institutions, and the expenditure of any other moneys; and to do such other acts as are necessary and proper for the execution of the powers and duties conferred upon them by law."}

Here certainly is no evidence of any purpose to change the character of either of the institutions. It is the "said institutions," as they exist which the Board is to govern. The separation is expressly maintained. Each is to have its own president, professors, instructors, officers and employees. The Board of Education is to take the place of the previous Board of Regents and Boards of Trustees and to become vested with their powers. One general supervising board is made to take the place of three. The new Board is charged with "the government of said schools," and empowered "to manage and control the property" of each. The one power is as broad as the other. They certainly cannot take the property of the University and use it for one of the other schools for the Constitution says that "the university fund shall be applied to that institution and no other." And yet
if the three institutions are to be dealt with as one "to all intents and purposes" then the property of all should be dealt with as one common fund to be applied and used for one institution or the other as need may be. This would be clearly unwarranted. And there is no greater warrant for taking from the University, a school, whether of Law, Medicine or Engineering, which is a proper integral part of it, and transferring it to one of the other institutions. If donations of money or of property have been made to the Law or Medical or Engineering school in the view that they were to be maintained at Iowa City, certainly they can not be transferred with the school to some other place.

The remaining sections of the act deal with details that do not bear upon the question, but the repealing section is significant. It repeals specifically twenty-one sections of previously existing law relative to these three educational institutions. It does not repeal Sec. 2640 of the Code of 1897 which defines "the object, departments and degrees of the university," nor section 2648, which defines the "courses of study" in the agricultural college, nor yet section 2677, which defines the "branches of study" in the Normal School. It repeals sections before and after and between, but it leaves the sections which determine the distinctive characters of the institutions untouched. And in the face of these specific repeals, it cannot be claimed that there was an intention, by the general repealing clause of all acts and parts of acts inconsistent with this act, to repeal the vital sections above mentioned.

There is nothing in the latter act inconsistent with these sections. There is not a word in the latter act defining the scope of any of the institutions and so the law already upon the books, which did make such definition stands unimpaired.

The act of the legislature is in entire harmony with the Constitution. By the Constitution section 8 of article nine a single Board of Education was given control over all the educational institutions of the state. This was not inconsistent with maintaining the University as a distinctive institution, for provision for that was made in the very next section
of the same article. And in section fifteen of article nine, the legislature is given power to abolish or reorganize the Board and "provide for the educational interests of the State in any other manner that to them shall seem best and proper." But standing with that always and unimpaired by it or by what may be done under it is the explicit command,

"The State University shall be established at one place without branches at any other place, and the university fund shall be applied to that institution and no other."

The people in their primary capacity, promulgated this mandate and they, and they alone, can recall it.

The proposal to strip the University of its College of Applied Science is in my judgment in violation of this mandate and the attempt to carry it into effect may be enjoined at the suit of any citizen of the State. 165.

The legal opinions gave added reason to the Alumni Board for confidence in ultimate victory. They were, however, skeptical about making an immediate appeal to the courts lest, perhaps, they be accused of blocking a plan to eliminate duplication and at the same time offer no solution or constructive plan. Furthermore the work in engineering would continue to remain dependent upon the legislature for necessary appropriations and consequently it would be useless to establish the right of its existence unless it was approved by the legislature. 166 In view of these facts Dean Raymond and others were of the opinion that favorable legislative action must be secured even though an appeal to the courts were made. He there-
fore suggested that "a truthful statement of the situation and the University's claim" be presented to every legislator elected and to all of the newspapers of the state. In addition, he suggested, "that the alumni of the state be written and asked to interview and commit, if possible, the legislators from their districts." Already the Iowa State College Alumni had been organized to protest the Board of Education's action and secure opinions on the matter from candidates for the legislature.

Although much had been done by alumni managers to evidence alumni opposition to the "removal of engineering" the first great manifestation or demonstration of opposition was stated at the annual homecoming reunion, November, 22. In what may properly be called an "Engineering mass meeting" on the eve of homecoming, alumni enthusiastically pledged themselves to fight "to the last ditch" to prevent what they termed "the emasculation of the University." The engineering question was introduced by the Honorable Sidney Foster of Des Moines. After declaring that he was an alumnus of neither institution but "only a tax payer" Mr. Foster urged the alumni to unite and stand together against the action of the Board of Education; a proposition which if effected would work injury not only to the University but also to the entire
state. Speaking in the same vein was a fellow-townsman James B. Weaver and Carl F. Kuehnle, of Denison, both of whom reiterated the plea for solidarity and called upon the alumni to become as one and carry a campaign of education into every county in order that the situation might be placed before the people of the state in the proper and true light. They were unanimous in their belief that if properly informed, the people of Iowa would never allow the board's action to be carried out or made effective.

The enthusiasm and determination displayed at the homecoming was soon manifested in the "Alumni booster gatherings" which convened in all parts of the state. Characteristic of many were the ones held at Cedar Rapids and Marengo. In the "Parlor City," following a banquet attended by alumni and ex-students the arguments favoring the position of the Board of Education and the alumni were stated by Chairman Boyd of the Finance Committee and Mr. F. J. Randall, prominent alumnus of that city. A similar "gathering" at Marengo was closed only after those attending had adopted "resolutions protesting the board's action and urging the legislature to oppose it and stand by the University."

To further the "campaign of education" the three hundred and twenty five engineering alumni were solicited and the money they contributed was used, in
the main, for preparing and distributing literature on
the subject of engineering. Perhaps most important of
the literature distributed was an alumni bulletin en-
titled, Iowa's Educational Problem, starting with the
premise that "the cause is greater than any institution
or any Board" eight prominent alumni of the University
herein expressed their opposition to the plan of state
school reorganization as a wrongful solution of the
problem caused by the Board's delegation to the finance
committee, of powers "not assigned to it by law and for
which it admits its unfitness." In consequence of
such delegation the sponsors of the bulletin declared,

the system now proposed by the Board is
claimed by us to stand upon erroneous state-
ments of fact and upon unsound principles
educational and legal, and to be fraught
with grave peril to all three institutions
and to the cause of education in Iowa.

By describing the evaluation of the Board of
Education's plans as found in reports and minutes of the
board meetings a series of facts never before made public
were referred to the people of Iowa. After a deliberate,
logical and enlightening discussion of the question in
which the constitution, statutes and the Lehmann opinion
were cited as supporting evidence for their statements
those under whose auspices the bulletin was published
submitted the following conclusions:

1st. That the separate functions of
the Board of Education and the Finance Com-
mittee have not been kept clearly in mind; that the functions of the latter have been unduly enlarged and a too exclusive reliance placed upon the investigations of the chairman of that committee who, having fixed upon a pet plan, has not been able to avoid in his statements to the Board and the State bias in favor of a particular scheme and the coloring of facts common to human nature under such conditions.

2nd. That the Constitution of Iowa and the statutes forbid the removal of the College of Applied Sciences from the University and that the State has not attempted to confer such power on the Board of Education.

3rd. That the historical statement made to the educators and to the state is erroneous and misleading in vital particulars.

4th. That the expert opinions submitted with the report in effect condemn more than they approve the proposed plan.

5th. That Household Economics should be taught in a popular way at all three institutions.

6th. That in the provisions of the constitution and the statutes relating to the University and the action of the state thereunder, and in the Morrill Act and the contemporaneous action of the Agricultural College and of the legislature relating thereto, will be found inevitably if studied carefully, the straight, clear path to a true and wise solution of the problem of co-ordination and of the question of economy.

7th. That differences in present equipment or attendance are relatively secondary matters when weighed beside the great cause of permanent and efficient educational facilities for the youth of Iowa for all time.

8th. That it is the duty of the state to make at once the necessary appropriations for immediate necessities at the several schools in the way of salaries, etc., and take up anew the problem of
providing the state an adequate educational system that shall have in mind the organic law of the state, the functions which the several institutions are best adapted to perform and the needs of the state not only in university instruction but in bringing closer to the people teaching in agriculture, the trades, home economics and teaching.

9th. That we pledge to the people of Iowa in the foregoing task, if undertaken without fear or favor, the loyal support of the alumni of the University throughout the state and we repeat that our Alma Mater does not desire to profit by depriving any of her sister institutions of any department to which they are entitled in the judgment of the people of Iowa.

10th. That in all we have said of engineering at the State College or the Morrill Act we are prompted by no feeling of jealousy. If the state shall continue engineering of a university grade at the Agricultural College in competition with that at the University, which it is bound to retain, it does not concern the University.

11th. We wish to urge with all our power the duty of the presidents, alumni and students of the several schools to drop the spirit of bitter rivalry and political methods, come to the aid of the state in the solution of this problem and have the courage to solve the questions involved in the light of the best interests of the youth of Iowa, the needs of the state and the institutions and organic law provided to supply those needs.

Following the publication and distribution of Iowa’s Educational Problem, by the alumni the Board of Education held a meeting and directed the three lawyer members, — Messrs. Murphy, Trewin, and Eicher, to prepare a reply to Mr. Lehmann’s opinion. In the reply which was given wide circulation in the newspapers and in pamphlet form the three attorneys agreed, that because
a college of applied science, larger in point of students enrolled and equipment, had been established at Ames for many years, the Board was not establishing a branch of the University, within the meaning of the Constitution. It was merely discontinuing something at the University which it had a right to do or if not, the Legislature had a right for them.

The legislature always has either itself exercised the power to determine what branch of learning should be taught at the University, or it has delegated this power to the board in charge of its affairs.

The legislature did not by any act establish the college of applied science at the university. It simply permitted the board of regents to do so, long after the constitution of 1857 was adopted. One legislature by adopting laws cannot bind a future legislature. No more can one board of regents bind a future board. 182

The impact of the Board's reply upon the public opinion was reduced to a minimum as the sustained and determined opposition of alumni was expressed by prominent state leaders. Already Senator George W. Clarke and Governor elect had declared:

If I have been correctly informed as to the extent and import of said order, I should not have favored the changes proposed and do not now. ... I venture to suggest, that it seems to me, after a brief examination as I have been able to make, that in its action the board may have exceeded its powers. 183

A month later, on November 30, of the same year, Senator Sherman W. De Wolfe expressed himself as opposed to the
entire proposition and prepared to urge a great advance in the extension work of the State University of Iowa in order that it might touch the whole state. He declared that the standards of the board were wrong in its effort to separate "practical" from "pure" education and condemned the statement that such changes were the intent of the legislature which established the Board of Education. Declaring that such a statement was either incorrect or else the result of political treachery Senator De Wolfe said:

Senator Whipple, the author of the law assured me time after time that in seeking the change of management that they had no designs upon or against the State Teachers College. He said that the real purpose was to curtail the political activities of some of the men at Ames whose names is not now necessary to mention. And to remove from the Legislature the annoyance of the Lobbies maintained by two of the schools especially relative to appropriations.

Important and significant as were the statements of George W. Clarke and Sherman De Wolfe in helping to mould public opinion, the culmination in this phase of the alumni campaign was reached on January eighteenth and twenty-first, as the joint statement of thirty prominent alumni, and residents of Iowa, and a statement by Senator Albert B. Cummins were published.

Included in the group of alumni and Iowa residents was a former governor, three former congressmen, a former speaker of the house of representatives, legis-
lators, judges and high ranking professional men.

Unique and powerful was their influences as they united in an appeal to the alumni of the State University to join in an opposition that "arises not from institutional bias" but from reasons "placed and justified on broad educational grounds", to the proposal to remove the college of engineering from the University. At the same time, they urged the alumni to communicate with their representatives and to voice their opposition "in a manner commensurate with the love that you feel for your University and the cause of education in Iowa."

Carrying great weight, especially in certain quarters, was the statement of Senator Cummins in which he unqualifiedly endorsed the Lehmann opinion. An alumnus of neither school his opinion was that of a lawyer rather than an adherent of either side in the fight. He stated:

I believe that Mr. Lehmann announces a correct conclusion with respect to the constitutional aspect of the matter. If the legislature either directly or through a board created by legislation, can take many from the university a long established department of education which according to the accepted standard of university instruction, is a substantial part of the University and continue it elsewhere, it is manifest that the constitutional provision is left without practical effect. If it can so deal with the college of applied science, it must follow that the college of liberal arts college of law, medicine, etc., can be transplanted under the same authority. I have never believed that any such interpretation could be put upon the constitution."
Neither the statements of Senator Cummins and his colleagues nor that of prominent residents was sufficiently authoritative or final to deter the Board of Education in pursuing its announced policy of "coordination and consolidation". On January 24, 1913 both Mr. Trewin and Mr. Boyd expressed themselves as being "absolutely certain" that their proposition would pass the legislature and added that already they had "enough votes promised to carry it." Alumni, however, in Des Moines denied such claims by assertions that were equally pretentious, although based on the statement of the Honorable George Koontz. Commenting on the subject Mr. Koontz said:

There has been but little discussion of this measure so far ... from what there has been among the members in the House it appears to be pretty near unanimous that the schools should not be disturbed, especially just at present. 191

Despite the fact that the Iowa legislature had well founded opinions and precedents established by the Colorado Supreme Court and more recently by the North Dakota Legislature to guide them in deciding the issue, legislators shied from the inevitable contest over the plans proposed by the Board of Education. Appearing as somewhat of a "powder mine" no one could tell when it would come up for discussion but all anticipated "lively fighting" when it did. It was expected, however, according to the Honorable George Koontz, that University
alumni would introduce the question and that friends of the State Board of Education would then come to the defense of the Board's action.

Unable to avoid the issue any longer and by some anxious for its settlement a concurrent resolution was introduced in the senate and house on January 28, 1913. Introduced in the Senate by Senators De Wolfe and Spaulding, and in the House by Representatives Atkinson and Kane it was,

Resolved: That the General Assembly of Iowa, in concurrent action, respectfully calls the attention of the Iowa Board of Education to the following:

First: That since the action of the State Board of Education ordering the removal of Domestic Science from the State College at Ames to the State University at Iowa City; the elimination of Engineering from the State University and centering the same at the State College at Cedar Falls, there has arisen much opposition to such action of the State Board on the part of the people of Iowa, and many educators and persons of wide experience and devotion to the educational interests of Iowa have expressed the opinion that the Board erred in its action, and that the effects of such action will be injurious to the several institutions and the cause of education in Iowa,

Second: That grave doubts also have arisen as to the legality and constitutionality of the action of the Board, and many legal authorities of a character to command respect and consideration have expressed opinions holding that such action on the part of the board is without legal authority and in some particulars is in conflict with organic law of the state,

Third: That if the General Assembly should adjourn without action and later the courts should
hold that the action of the Board was illegal and without constitutional authority, these several colleges and departments affected by the action of the Board would be without financial support for the ensuing two years and on that account would be demoralized and irreparably injured; therefore,

Be it Resolved by the Senate, the house concurring, that the Board of Education be advised and is respectfully requested to rescind its action of October 8, 1912, as cited above, relative to such colleges and departments of the three institutions, and to so amend its budgets and recommendations to the governor and to this General Assembly as will give to such colleges and departments such support as they would have received if such action had not been taken. 197

In order to make hearings possible the supporters of the resolutions had them referred to the Committee on Educational Institutions. It was suggested by members of the Board of Education that their representative be given a hearing of one and one half hours and that the presidents of the three institutions be given a half hour each. This suggestion was stubbornly opposed by members of the university alumni. It was their opinion that in such a hearing the presidents would be not only virtually gagged but also unable to divest themselves sufficiently of individual feelings for the three institutions, to voice the entire opposition from the standpoint of the State. Failing in their efforts to secure the type of a hearing desired the Board after intimating a willingness to have its action held in abeyance for two
years while a commission investigated the questions involved, requested that a joint meeting of the committees on Educational Institutions be held. Prior to the joint meeting which was arranged for February 5, members of the alumni declared themselves unalterably opposed to the suspension of the Board's action for two years. This they declared would not only be fatal to efficient work but would give the Board of Education an opportunity to build up one school at the expense of the other. James B. Weaver, chairman of the University Alumni Committee emphasized the demand that the action of the Board be "absolutely rescinded now so that it would take a new order to put it into effect." He declared that while he could not speak for the legislators, he spoke for University alumni and desired to say with all possible emphasis that:

We desire no delay for "gum shoe work", and we are fully convinced that our "best card" is absolute and fearless publicity. We therefore urge a public hearing before the joint assembly, believing that the people of Iowa are entitled to know all the interesting facts surrounding the board's action. We make but one condition, namely, that at such hearing ample time be given for full presentation of all the facts. 201

Despite the statement of Mr. Weaver, the President of the Board, James H. Trewin argued for an hour and a half on February 5, in the joint session, of the house and senate committees on Educational Institutions. In his almost filibustering speech, Mr. Trewin declared that the board had only carried out the program for which it
was created and that it was now up to the legislature to decide whether or not there shall be duplication in the state educational institutions.

At the close of Mr. Trewin's lengthy address the joint committee voted to have a public hearing on the question. By this action the question was thrown to the legislature and became a fight for the "complete rescinding of the board's action," in as much as the Board of Education in a special meeting preceding the joint committee session voted not to ask for a compromise, as previously suggested. Assuming the task assigned by action of the joint committee on Educational Institutions the House adopted a concurrent resolution on the day following the joint committee meeting. Introduced by Representative Jensen, it was resolved;

That the House and Senate meet in joint executive session at one P. M. on February thirteen, for the purpose of a joint hearing on the question of the future policy of higher education in Iowa. Received by the Senate, on February 7, the resolution was adopted after being amended by striking out the word "executive". As amended, the resolution was adopted by the House on the next day.

The days which followed the final adoption of the concurrent resolution until February 13, the day on which the hearing took place were filled with speculation, argumentation and statements, in regard to the action of
the Board and the anticipated action of the Legislature. Of particular interest, in view of his intimate connection with a similar engineering crisis, of 1904, was a statement made by former President George E. MacLean. Expressing his disapproval of any coordination of the state schools which was not based on sound educational principles he declared:

In my opinion educational peace in Iowa can be insured only by a settlement along the line of sound educational principles by which each of the three kinds of institutions would have its own work.

The University has certainly kept within its bounds. Even the report of the Whipple Legislative Committee of 1906 discovers this fact. 209

At the same time, he indicated that the action of the legislature was keenly awaited by many outside of Iowa and that the action of the Iowa legislature would have far reaching significance. In a letter to Dean Raymond, under date of January 27, 1913, the former president wrote:

The 20 State Universities separate from Agricultural Colleges must be deeply interested in the way the battle goes in Iowa. In short, as we have known for a dozen years the contest in Iowa has a national as well as an Iowa bearing.

With a wrong decision in Iowa in more states than that, the history of the old University of Ohio, at Athens and of the College of Agriculture, at Columbus, now Ohio State University will be repeated. The character of University Engineering will be changed and also the intensification of Agricultural Education will be lessened to develop great technical schools or so called Universities. 210
On February 11, it was announced in newspapers that James H. Trewin and James B. Weaver would represent the Board of Education and the alumni at the legislative hearings, the latter, opposing the Board, "in all its orders and not simply from the university standpoint."

Actually, however, the joint convention was addressed "on the subject of the future policy of higher education in Iowa" by, D. D. Murphy, J. B. Weaver, Senator Trewin, Judge C. G. Lee, H. L. Adams, Robert Reno, and W. O. Payne. Most important of the group and perhaps most sensational was the address made by Mr. Weaver.

By his vitriolic attack on R. W. Boyd, chairman of the Finance Committee and James Trewin, Chairman of the Board of Education, Mr. Weaver seemingly destroyed the slight remaining hopes for passage of the bill proposing to consolidate engineering at the State Agricultural College. In his speech very strong charges were made and motives for the Board's actions were challenged.

Particular emphasis was placed upon the fact that in a document sent to President Van Hise of the University of Wisconsin, with the Board's authorization, it was stated that engineering should be consolidated at the Agricultural College because "far less friction, personal and sentimental would result from this procedure" while in the public records the same statement was omitted. Very
effective and perhaps very forceful for the advancement of the cause for which he spoke was the evidence he produced showing that Mr. Trewin and Dr. R. A. Pearson, President of the Iowa State College of Agriculture and Mechanic Arts had agreed in March, 1912, "to convert the agricultural College of Iowa into an institution comparable to Johns Hopkins University and this included a decision of the engineering question." Written proof of the agreement was made public and widely publicized producing perhaps, the greatest sensation of the controversy.

The record of the agreement as made manifest at this time, revealed that on March 19, 1912, Dr. Pearson stated in a letter, the conditions under which he would accept the Presidency of Iowa State College of Agriculture and Mechanic Arts. Chief of the stipulations which included control of the faculty, increases in salary and powers of administration was the following:

It is the intention of all concerned to maintain at Ames an institution which will fully meet the needs of the state, along the present lines of its work; agriculture, engineering and veterinary science. These divisions are to be supported by such instruction in literary sciences and fundamental subjects as may be necessary. Future arrangements for instruction in home economics are to be determined. The grade of work in the present courses of agriculture, engineering and veterinary science is to be maintained on such a level as to compare favorably with similar work in corresponding institutions of other states.
In his reply under date of March 22, 1912

Mr. Trewin wrote:

You have mapped out such a broad policy in regard to the College of Engineering and Mechanic Arts, covered so many suggestions and committed the board so definitely to certain lines of policy that I feel I have no authority to speak for the board in reference thereto at this time. I do not believe the board is willing to or should commit itself now and in this way to some of the policies you suggest.

1st. It is generally conceded we ought not maintain the two colleges of engineering in Iowa covering the same field. Many people believe the college of ENGINEERING SHOULD BE AT THE UNIVERSITY and many that it should be at the College of Agriculture and Mechanic Arts. This question should be settled by the board, but NOT WITHOUT CAREFUL CONSIDERATION.  

After receiving Mr. Trewin's letter in which his terms were rejected, Dr. Pearson wrote a second letter on March 28. In this letter he stated:

I should like to think of the institution at Ames as the great technical school of the state, and in its service to the state and its RELATIVE STANDING with other institutions comparable with such well known institutions as the Massachusetts Institute of Technology in Boston, and JOHN HOPKINS UNIVERSITY, at Baltimore.

But I note there is some doubt as to the disposition of the departments of engineering. SO FAR AS MECHANIC ARTS ARE CONCERNED, I suppose it necessary under the federal statutes to provide for this instruction at Ames, and having them so, it would seem most desirable to continue OTHER BRANCHES OF ENGINEERING at the same place. It would seem that the engineering work properly belongs at Ames as a part of a complete technical institution. Civil, sanitary and topographical
engineering belong to the same family as agricultural engineering and they should thrive better at Ames than at another institution where so-called cultural subjects predominate, furthermore they would be helped by association with the engineering work. I WOULD NOT WISH TO GO TO AMES IF THE ENGINEERING WORK WERE TO BE TAKEN AWAY.

With favorable answer to the questions as to the retention of the engineering work at Ames, the matter will depend upon the relative attractiveness between the position at Ames and the one in the east which I referred to with you. 218

The letter from Dr. Pearson was received, on March 30. It called for immediate action. The result was an exchange of the following messages. In the first message sent on the day he received the letter, Mr. Trewin declared, "I sincerely hope and believe we can reach a satisfactory understanding. Will wire you next Wednesday." As agreed on the next Wednesday, he sent the following telegram:

Board in session says it is the intention of the Board to maintain and develop the division of engineering at Ames. Salary will be increased in due time. We urge you to accept. Answer by wire if possible. 219

The acceptance of Dr. Pearson was received on April 220 fifth.

The disclosure of this agreement was the climax, not only of Mr. Weaver's address, which was applauded almost from start to finish, but also of the whole educational controversy. The disclosures gave clarity to statements until now almost incomprehensible, and dealt
the finishing blow to the claim that all actions of the Board were open and designed for the best educational interests of Iowa. In his reply Mr. Trewin ignored the charge pertaining to the agreement between Dr. Pearson and himself and the consideration which most every one considered the pivotal matter in Mr. Weaver's address. Neither admitting nor denying its existence Mr. Trewin stated that no member of the board or finance committee could be accused of any omission in the public records since the entire board would stand responsible for what had been done.

On the following day after the House had convened pursuant to adjournment, Representative Gerrit Klay in an effort to get the school controversy before the assembly in concrete form introduced a bill defining the functions of the three educational institutions affected by the coordination plan of the Board of Education. The bill as introduced, specifically stated that a College of Applied Science, including engineering should be maintained at the University, and "divisions of instructions" in civil, mechanical, electrical, mining and farm engineering at the College of Agriculture and Mechanic Arts. Mr. Klay declared that

Under the resolution introduced we can only condemn or approve the board's actions. The legislature is not an advisory body. It was designated to enact laws.
I provided in this bill that the schools should remain just as they are. It is now within the province of the committee or of the legislature to make such amendments as may be desired. It can be passed either as it is or changed to conform to the action of the board. 226

After the second reading, the bill was referred to the committee on Schools and Text Books. On February 20, reporting through its chairman, Representative Jensen, the committee recommended a bill for the establishment of a temporary Educational Commission. Composed of nine members, five of whom were appointed by the governor, and four, namely, the three presidents and the attorney general being members ex officio, the Commission had for its purpose the collection of comparative data on the courses of study which with conclusions and recommendations deemed advisable, were to be reported to the Governor, on or before November 15, 1914. In the meantime unless changes were authorized by the legislature the functions, courses of study, and colleges or departments maintained in the three educational institutions, in September 1912, were required to be continued.

On the same day that Chairman Jensen submitted the majority report, Committee men D. E. Kulp, L. M. Enger, J. A. Bliss and Arthur Pickford dissenting from the action of the committee submitted a minority report in which they recommended the bill introduced by Mr. Klay, for passage. With the two reports having been placed
Representative Klay moved that they be made a special order for February 25, 1913.

The adoption of the motion made by Mr. Klay was the beginning of the final stage in the controversy. In a final effort to win the legislator's support those favorable to the Board's action circulated a comparative attendance chart in which the entire freshman class at the University was omitted. Despite the violent reaction of the Iowa City Republican another chart showing the "cost per student" in the two schools was circulated three days later and brought forth again strong denunciation.

The time having arrived on February 25, for consideration of the report recommending the amendment and passage of the Klay bill, Mr. Klay moved that the minority report be substituted for the majority. A roll call demanded by Mr. Klay and Mr. Brockway, a Board supporter, revealed the motion to have passed by a vote of fifty three to forty-eight. Almost at once, following the substitution of the minority report, a substitute amendment, which tested for the first time the strength between friends of the board and its opponents, was proposed by Representative Dixon. Addressing the Speaker Mr. Dixon proposed, for passage an amendment in which it was declared that,
The State Board shall prescribe courses of study for the educational institutions under its control, providing for co-education of the sexes and for ample instruction in home economics at each institution. No course of study, now or hereafter established shall be discontinued except with concurrence of six members of said board. 243

Almost tantamount to an approval of the Board's action the House promptly and decisively defeated the proposed amendment by a vote of sixty five to thirty two.

Opening the debate on the question, Mr. Klay, after declaring that the time had arrived for the legislature to consider the future welfare of the state institutions said:

We are here as statesmen with the single object in view of legislating for the larger welfare of the State of Iowa. The question is not one for three cornered warfare or a tug of war but for settlement on a basis which will be for the best interest of the state which we represent.245

Explaining the need for immediate action and prompt settlement of the question and thus proposing a complete rejection of the commission plan provided for in the Jacob's bill, Mr. Klay said:

The sooner this is settled the better it will be for both schools involved in the controversy. Continued for two years longer as it would be under the commission plan of investigation contemplated by the Jacob's bill, irreparable injury would be done these institutions.

The governor of the state will soon have a number of vacancies to fill on the board of education. Before he makes the appointment he should know what the attitude of the legislature is. 246
The Committee's action was defended by Mr. Jensen who declared that the committee had selected the Jacob's bill for "reasons of caution". Members of the Committee, he said, feared that with an immediate passage of the Klay bill some important provision might be overlooked. The delay provided for in the Jacob's bill would give ample time for investigation and study before fixing the course of study in any one of the three institutions.

Mr. John W. Jacobs, author of the bill, after making the claim that legislators were rendering a decision of this all imparting question under pressure caused by its injection in the most recent political campaign urged that it be put over and submitted to the judgment of the next legislature.

The bill was debated calmly and dispassionately with none of the "real fire works" predicted being present at any time. Although great publicity had been given to the controversy few visitors were present during the debates and galleries were practically deserted as the few outsiders, most of whom were senators took places on the floor. The absence of visitors was due perhaps to the strength evidenced by the vote on the Dixon Amendment and the prevailing belief among University groups that the bill would pass. The belief was amply justified on February 26, for on that date, the Klay bill
providing that

the several colleges, schools and departments of the State University, the State College of Agriculture and Mechanic Arts and the State Teachers' College, in operation September, 1912, are hereby established and shall so remain until changed by the affirmative vote of seven members of the state board of education. 261

passed the House by a vote of eighty five to ten.

Following the passage of the bill by the House 253
the Senate delayed the requested concurrence, by re­

ferring the bill to the committee on Educational Institu­
tions, where already a sub-committee was at work on a similar bill. While in the hand of the committee the "real fire works" predicted for during the House be­
bates might well be said to have occurred. Confronted with almost certain defeat Mr. Trewin made his final stand as he directed a bitter assault upon Dean Raymond and charged him to be incapable and unequal to handle the tasks required of one heading a great engineering college. Alleging that they wished the bill to re­

ceive more serious study, but more probably, because he wished to bottle it up in an unfriendly committee, the senate committee on Educational Institutions referred it to a subcommittee consisting of Messrs. Larrabee, Francis and Jones, the first two of whom were actively supporting the board and the other definitely sympathetic. The determined effort on the part of some members of the senate committee to uphold the state Board of Education
by a recommendation that the bill be indefinitely post-
ponded was defeated when the motion by Senator Arney,
proposing that the Committee report be accepted, was
supplanted by Senator De Wolfe's motion that the bill go
on the calendar. The motion of the latter carried
by a decisive vote and thus defeated the effort of the
Board of Education to prevent a vote on the school
controversy in the senate. In an effort to prevent the
action of the Board from becoming effective and at the
same time not have the Board over ruled by the legis-
lature, Senator Cowles introduced the following joint
resolution on April 2, 1913.

Be it resolved by the General Assembly of
the State of Iowa:

That whereas conditions have arisen which
make it unwise for the state board of educa-
tion to carry into effect its order of October
8, 1912, relating to changes in the courses of
study in the different schools under super-
vision of the board, therefore be it resolved
that the board of education rescind its order
of October 8, 1912.

Referred to the committee on Educational institutions
after the second reading it was reported back, on
April 4, and passed by a vote of forty three to four.

The Board of Education promptly and formally
rescinded its resolution and thus brought to an end
a fight perhaps unequalled in the history of engineer-
ing and one wherein Dean Raymond and the Alumni were,
for the most part, "the Saviors, not only of the College
of Applied Science, but of the University."

As the engineering crisis of 1912-1913, became a part of engineering history George E. MacLean in a letter to Dean Raymond expressed a warning and admonition, the wisdom of which was to be fully realized before the third decade of the century was ended. After indicating his satisfaction at the outcome of the six month struggle, so successfully concluded, the former University of Iowa President wrote:

I hope the Senate compromise measure was passed in good faith. Eternal vigilance, however is the price of liberty and progress until administrative freedom is secured.

The imperative need for vigilance was demonstrated, on January 26, 1939, as a committee on consolidation and coordination of state government was appointed to study and make recommendations for the execution of the new republican administration's economy program as preached by Governor-elect Wilson and Lieutenant Governor-elect Hickenlooper. Composed of seven representatives and seven senators the joint committee was instructed to begin an immediate study with a view to consolidating overlapping functions and a coordination of activities under single heads in order to effect real economy and at the same time increase government efficiency. It was intended that this committee should begin work promptly in order that recommendations
for the renovation of governmental machinery might be submitted and acted upon during the opening days of the General Assembly. The hurried action of the legislators as evidenced in the appointment of the committee was praised by Governor Wilson in his inaugural address and without being specific as to detail he requested legislative action for the "elimination of useless bureaus and commissions and the consolidation of various department's bureaus."

In accordance with the Governor's request and believing that "changes were demanded by the voters when they returned the Republican party" the house-senate group decided in an evening session, on January 25, 1939 to abolish the College of Engineering at the State University of Iowa. This decision was followed by the introduction of a bill, on the next day, for an act to require the State Board of Education "to disestablish the school of engineering at the state university, and make directions for the disposition and transfer of the equipment and property of said school. Introduced in the interest of economy, allegedly saving the state seventy thousand dollars annually, the action was taken without the knowledge of Dean Francis M. Dawson of the College of Engineering or other university officials.

Although the proposal was received with general
apathy on the Iowa State College campus it met with almost immediate well organized and determined opposition from the College of Engineering at the University and engineering alumni. First to act were Dean Dawson and the University engineering students. Thoroughly aroused over the legislative proposal they began promptly to carry out a systematic program designed to place facts regarding the engineering college and fallacies in the proposed combination before the Iowa legislators, alumni and students of the University.

A meeting of the University's Associated Students of Engineering was called by Franklin O. Eddy of Marengo, president of the group, on January twenty ninth. At this meeting it was decided to have Maynard Dix of Cedar Falls, Frank Park, of Iowa City, and Parke Woodworth of Ipswich, South Dakota go to Des Moines and contact Iowa legislators in opposition to the house bill, to circulate petitions among the engineers and the general student body, and to prepare a factual bulletin to be sent as soon as possible to engineering alumni of the University, to professional alumni and other prominent citizens in the State. A special bulletin in the form of "an open letter to the citizens of Iowa" was prepared for publication the following day.

With this meeting the machinery of opposition was set in motion. The three engineering students went
to Des Moines the following morning where almost at once they began calling upon senators and representatives to urge the defeat of the bill. Although they brushed all questions concerning their lobbying activities aside with the statement that "we're here on an educational trip to find out what really goes on in the legislature", Senator John P. Berg of Cedar Falls said "the boys were very emphatic. They told me they want that bill defeated right now." Representative Arch McFarlane of Waterloo stated that the University students had called on him and asked for his support in defeating the bill.

At the same time that engineering representatives were contacting legislators in Des Moines, petitions protesting the disestablishment of engineering were being circulated in Iowa City, among the engineering students and other students of the University. Signed by four hundred and seventy six engineering students the petition stated:

Relative to the proposed consolidation of the Engineering College of the State University of Iowa with the State College of Agriculture and Mechanical Arts: We do hereby resolve and place ourselves on record as being emphatically opposed to such consolidation and we respectfully draw attention to the findings of the several national commissions which show definitely that this move would not be economical.

Both engineering schools are full to capacity. If the University School were transferred to Ames a considerable capital outlay would be required to house and equip it. There would be no saving in institution unless it were proposed to reduce the quality of instruction. The Committee is persuaded that no responsible
officer of the State purposes to save money by providing cheap and inferior instruction. We earnestly petition the governing body of the State to refuse sanction of this undesirable transfer. 288

In another petition signed by an estimated twenty-five hundred or more university students, both men and women, it was declared that:

We, the undersigned students of the University of Iowa, although not students in the College of Engineering are of the opinion that any action to remove the Engineering College would not be economical and would seriously damage the prestige of our University. We feel that the absence of an engineering College would irreparably weaken the operation of the other colleges, particularly in the allied sciences, and would also interfere with the opportunity of our engineering students to continue their studies.

We therefor petition that the 48th General Assembly, of the State of Iowa, look with disfavor on the bill (H. F. - 152) to disestablish our Engineering College. 290

The two petitions together with signatures of university students were presented to Governor Wilson on February 1, by Maynard Dix, Fred Kubias and Parke Woolworth at a special meeting arranged for them by the director of State W. P. A. and former University of Iowa professor, George Keller. Although indicative of active opposition to the bill on the part of the students the petitions were not introduced directly in the legislature, and were very secondary in importance when compared to the publication and circulation of the factual bulletin entitled, "Historical, Financial and Statistical Facts"
Concerning the College of Engineering at the State University of Iowa.

Convinced that a matter so serious in its import and so vital to the future of engineering in Iowa needed the careful and deliberate judgment of every citizen, the sponsors of the bulletin aimed to present in clear, definite and concise form the facts of the case in order that the people of Iowa might judge for themselves the soundness of the proposed plan. After a brief statement of facts pertaining to the historical development of engineering at the University and an itemized statement of the "total inventory money value of equipment in the College of Engineering" and "equipment utilized extensively by engineering students" the recommendations of previous committees appointed to study the co-ordination of the University and the Iowa State College of Agriculture and Mechanic Arts were invoked as sound arguments against the proposed legislation.

Quoting directly from a report made in 1916, and which was the effort of such outstanding educators as Dr. James R. Angel, Dr. K. C. Babcock, Dr. L. H. Bailey, Dr. H. Godfrey, Dr. Raymond M. Hughes, and Dr. S. P. Capen, it was argued that

Mere duplication of courses of study may not be of any more disadvantageous or more to be deplored between institutions than between parts of one institution which
is the size of two, as will be pointed out presently, the cost to the people may not be increased. Two or more State institutions of the same grade but with different fields may, indeed produce a most wholesome stimulation, if they do not inharmoniously overlap, giving to the State a spirited and progressive development, preventing ingrowing, and separating its student body into groups small enough for the best educational results. The different faculties, working under separate administrations and developing in somewhat unlike directions, may add much to the achievement of the State.

It may be properly remarked at this point that the oft-repeated objection to the alleged exorbitant cost of duplication when the same subject is taught at two State institutions is largely specious. It costs no more to teach two sections of English at Ames and two at Iowa City than it does to teach four sections at Iowa City, assuming that the instructors are paid at the same rate in both places and that the size of the classes is kept constant at the point of maximum instructional efficiency. The overhead charge may be somewhat larger when the work is done at two places, but this is not necessarily the case.

From a second report made on June 10, 1926 to the Governor of Iowa by a committee headed by Dr. Samuel P. Capen it was equally justifiable to conclude that the proposed bill was unsound and fallacious. In this report the committee members agreed that:

Already the combined student bodies in engineering are so large that it is questionable whether they could be served as well in a single group as they are in two.

Consolidation would involve new construction and the purchase of new materials to replace those that could not be transferred.... Both Engineering Schools (in Iowa) are full to capacity. If the University school, which is the smaller, were transferred to Ames, a con-
siderable capital outlay would be required to house and equip it. There would be no saving in the expense for instruction, unless it was proposed to reduce the quality of instruction. 297

The fallacy of the economy argument advanced by sponsors and supporters of the bill was further indicated by another statement made in the same report under "suggested remedies for recurring conflicts".

The committee has already recorded its opinion that there is no final or permanent cure for duplication short of abolishing one or more of the institutions entirely. It has also endeavored to point out that the added financial burden of such duplication as now exists is of slightest consequence, ... Duplication in Iowa is slight as compared with that which exists among the other states. The surplus cost of such duplication as exists is not important. 298

In further support of their argument against the co-ordination of engineering and the charge of duplication the sponsors of the bulletin quoted from a more recent and perhaps, more thorough and complete report on a "Survey of Administration in Iowa". Submitted, by the Brookings Institution of Washington in 1933 to the Committee on Reduction of Governmental Expenditures, it was reported therein that:

There are, after all, only two or three possible alternatives for the solution of the Iowa educational problem.

One is to consolidate all engineering at one of the two institutions. If this were to mean the removal of engineering from Iowa City to Ames, as has been suggested, the cost of
additional building space and equipment necessary to take care of the added enrollment in engineering at Ames would in normal times more than equal the possible savings in administration and instruction for a number of years. 299

The bulletin of facts and statistics was widely distributed among engineering and University Alumni, members of the legislature and other prominent Iowa citizens. By them and by Iowa newspaper editors it was quoted and used in the campaign of opposition to the proposed coordination of engineering. Particularly was it useful for members of the Alumni who having come to realize their strength in 1913 rallied enthusiastically to fight the battle anew in 1939. Promptly after the introduction of the bill was announced Donald D. Holdoegel of Des Moines, Districts Board Members of the University Alumni announced that the alumni would oppose the bill.

Because, however, of the need for immediate action alumni members were unable to hold meetings, adopt resolutions and state demonstrations as had been done in 1913. Their opposition on this occasion consisted primarily in spreading true facts about engineering at the university in their communities and contacting their representatives from whom commitments were exacted. Participation in a post card campaign protesting the proposed action gave evidence of the unity among alumni and the complete opposition.
So unsound and injurious was the proposed legislation, as evidenced by the statement of facts pertaining to the Engineering College and circulated throughout the state, and so great was the expressed opposition to the proposal, that Chairman Dean W. Peisen of the house committee scheduled a special meeting, on February 7, to hear objections. Nor were legislators enthusiastic or anxious to see the bill pushed. By February 3, it was announced that legislators would not push the proposal, and two days later confronted with growing opposition and pressure from alumni the "rumor became rampant among legislators "that the bill would be postponed indefinitely. One house leader declared that, "if the bill isn't dead, it's very, very sick."

Despite the apparent fate of the bill, President Eugene Gilmore on February 9, met in a special closed session with the members of the committee on consolidation and coordination. Although the session was closed it is not presumptuous to say that the President was well armed with facts pertaining to the College of Engineering and undoubtedly gave much information to the Committee. On February 12, thirty five Iowa legislators visited the University campus and after inspecting the College of Engineering conferred with President Gilmore and other university officials. The prevailing certainty that
the attempt to disestablish engineering at the University had failed once more became even more certain as Representative Claypool, at a Lincoln day dinner in Iowa City on the evening of the legislators' visit declared:

The present legislature was elected on an economy program of coordination and consolidation. Some honest soul had gone to an extreme to introduce this bill. I do not believe that this bill will ever be reported out of committee to be voted upon, and if it does reach a vote it will be overwhelmingly defeated. 307

Speaking after the same dinner Representative Morrison, after asserting that the bill to disestablish engineering at the university represented a difference of opinion declared:

Someone had a sincere idea that the coordination of the two engineering schools was possible. We all make mistakes in the legislature. The concerted action of Iowa citizens and other friends of the University made this error apparent. Errors such as this happen because we all have a desire for economy and a reduction in taxation. 308

The statement of Representative Claypool was confirmed on February 16, as the joint house-senate committee on consolidation agreed to drop the proposed legislation and Peiser by unanimous consent obtained the "return of House File 152 to the Committee on Consolidation and Coordination of state government." By this action the third and most recent engineering crisis came to an end. Thus, on three critical occasions,
the College of Engineering was saved from disestablishment and the integrity of the University preserved because of student and alumni organizations and opposition, directed calmly, systematically, and effectively by the respective heads of the engineering school: Professor Alfred V. Sims, Dean William Galt Raymond, and Dean Francis M. Dawson.
Chapter VI
ENGINEERING IN THE COLLEGE OF APPLIED SCIENCE
1905-1927

The year which followed the advent of Professor Raymond to the University of Iowa and preceded the establishment of the College of Applied Science, formed somewhat of a prelude to the years which followed and was marked in many ways as a year of transition from an old to a new era in engineering education at the University. Preparations and plans for the erection of the new building and the construction of the dam across the Iowa river were for the most part completed, requirements for the admission to the School of Engineering were raised, and a form of reorganization was effected in nearly every part of the School.

First consideration to attract the attention of Professor Raymond and others vitally interested in engineering was, perhaps, the new building. At their meeting, in June 1904, members of the Board of Regents had made provision for a committee to visit some of the better known engineering buildings in the country and the following September the same board authorized and directed Regent J. H. Allen and Professor Raymond to make the visits during the month of October in order that information concerning the desirable and undesirable features of engineering buildings already in use might be available. Accompanied by Mr. W. T.
Proudfoot of Messrs. Proudfoot and Bird, architects, of
Des Moines, the committee visited engineering buildings
at Madison, Champaign, Purdue, Ann Arbor, Cornell, Lehigh,
Pennsylvania, New York University, Columbia, Harvard,
Massachusetts Institute of Technology, Troy and Schenec-
tady preparatory to drawing up the plans for the new
building to be begun the following spring on the corner of
Capitol and Washington streets.

As a result of the inspection tour it was de-
termined that

that the new building should be fire proof; that
it should be so planned that it could be built a
portion at a time, as the development of the de-
partments might demand; that ample provision
should be made for instructors' offices; that
space should be set aside for the use of students
when studying between recitation periods; that a
side light, preferably north, is best for draft-
ing rooms, and that these rooms should be long
and narrow, unless lighted from above. It was
also learned that a good sized auditorium is a
valuable feature for an engineering building,
as is also space in each drawing room and shop
for lecture and recitation purposes, and that
the shops should be distinctly separated from
those parts of the building devoted to theoretical
work, and yet easy of access. Many other minor
points were observed that were useful in planning
the building.

In accordance with the general floor plans de-
vised by Professor Raymond, the architects Proudfoot and
Bird designed the building and submitted the general
plans to the Board of Regents in January 1905. The
plans as presented were adopted and at the same time, the
architect was directed to prepare plans and specifications for the erection of the north section. Further action of the Regents authorized the secretary to advertise for bids on the proposed building, the same to be opened at their April meeting. Bids submitted by seven companies were opened, on April 16, and referred to the Building Committee with instructions that they be studied and the company submitting the lowest bid be given preference. Having submitted the lowest bid the contract was awarded to the William Grace Company of Chicago, in May, 1905.

Almost simultaneously with plans for the engineering building the Board of Regents was considering plans for the construction of the dam across the Iowa river. At their meeting in June, 1904, it was "moved by Regent Lane that the matter of the dam as regards location, amount of overflow, etc., be referred to the Executive Committee with authority to investigate the whole situation..." On June 23, the President of the University and the Secretary to the Board were authorized by the Executive Committee "to secure the services of some expert or experts to examine the situation in regard to the dam and give an opinion on its proper location and construction." Under the direction of Professor B. J. Lambert the investigation was undertaken and carried to completion.
Recognizing the fact that the old dam, built in 1840, was in need of extensive repairs, and also that a cut-off dam directly above it had lately been a source of trouble those in charge of the investigation, after a careful survey of several sites, decided that the new dam should be located a short distance below the Burlington Street bridge. Located at this place the dam would make available not only the head water of the old dam but also benefit by the small rapids immediately below it, and at several places between the old and the new — the fall of the river in this distance being something over two feet. Before making a final recommendation, however, in regard to a relocation of the dam, the committee made a careful topographic survey along both banks of the Iowa river between the Rock Island bridge and Terrill's dam. By plotting one foot contours to determine what land would be effected by the back water at a normal stage of the river it was shown that about thirty acres of adjacent lowland, most of which was at one time part of the river bed and therefore of little practical value for agriculture would be effected. With no serious property loss resulting, it was obvious that the advantages which would be derived from relocating the dam justified the recommendation that it be located below the Burlington street bridge. After hearing the report and recommendation, on January 26, 1905, it was moved by Regent Wright that
the plan proposed in reference to the dam, submitted by Professor Raymond be accepted and that we require of the citizens of Iowa City, as a condition of building the dam, a release from all property holders who may be damaged by reason of the construction of the dam at the place designated, or the filing of a bond or other agreement by which they will agree to pay damages that may accrue to the adjacent property holders by reason of the construction of the dam. 27

In consequence of the Board of Regent's action and in the interest of having the dam located below the Burlington street bridge a committee from the Iowa City Commercial Club appeared before the Regents during their April meeting and agreed to assume the necessary responsibility by signing bonds that would relieve the University from any further obligations caused by backwater damages. Action of the Commercial Club was followed promptly by the decision of the Regents to locate the dam south of the Burlington Street bridge,

provided the north half of the block fronting the river just south of Burlington Street be donated to the University for that purpose and that ground for abutments on the other side also be provided without cost to the University. 29

The ground demanded, as a condition for relocation of the dam was donated to the University by Mr. George Koontz and Mr. C. S. Welch, who, in behalf of certain Iowa City residents, met with the Board of Regents on June 14, 1905.
Agreement between the Board of Regents and the citizens of Iowa City having been reached and the location of the dam determined the bids for its construction and for which the Secretary had been authorized to advertise were considered and referred to the building committee with instructions to enter into a contract with William Morrabin of Iowa City. The company was instructed to construct

as much of the power house foundation as is necessary to make a permanent closure for the opening that would be left without such foundation, not making any further arrangements for the power house and omitting the metal gates, the openings to be closed up temporarily and no gates to be installed.

In addition to expanding in a material way during the year of transition in consequence of the legislative appropriation for engineering, in April 1904, further academic opportunity and efficiency was sought and provided for. Entrance requirements were raised almost at once by placing solid geometry on the required list and all work in engineering was greatly strengthened by requiring the time given to mathematics and mechanics to be increased twenty five percent. By an almost complete reorganization of the School of Applied Science the engineering course of study was so arranged that requirements for the first year were essentially the same in all branches of engineering and instruction was designed to include in every course the principles fundamental to all
engineering in order that graduates specializing in one
branch might easily specialize in any other should oppor-
tunity or inclination arise. Most commendable indeed
as well as indicative of progress was the establishment
of a special course in English for engineering students.
Devoted largely to theory of composition, "With practice
in descriptive and expository writing", it was, per­
haps, the beginning step in an effort to enrich the engi­
eeering curriculum by including more work in both academic
and sociological studies. It was evidence of the fact that
educators at the University of Iowa realized modern engi­
eeers must be educated to take their place as promoters
and managers of great enterprises, as counsellors of
capital, and as leaders in the development of great public
works looking to the conservation of both the health and
wealth of the world. It gave further indication that Uni­
versity officials realized that future engineers must be
prepared to stand before city councils and state legis­
lators as well as state and federal commissions. Further
curricular enrichment and engineering development were
effect ed by the establishment of new chairs and depart­
ments and by the reassignment of faculty members as well
as by the employment of new members. The new chair of
Steam Engineering, the establishment of which was demanded
by Professor Raymond as a condition for his coming to Iowa,
was filled by the election of Sherman M. Woodward. At the same time it was decided by the Regents that a chair of Descriptive Geometry and Drawing should be established and a professor secured before the opening of school in September 1905. Significant too, was the action taken by the Board of Regents on January 26, 1905, and by which, Professor Raymond was appointed Director of the School of Applied Science. Successor to Laenus G. Weld the appointment was in effect little more than a transfer of title in as much as Professor Raymond had in great part directed the school since his coming to the University. It gave assurance, however, that the vigorous administration of the preceding months would be continued and perhaps, be made more vigorous by his determination to have the "School" which he directed be given full college organization. This desire he expressed in the form of a recommendation to the President who in turn presented the proposal to the Liberal Arts Faculty and the Board of Deans. Following the Faculty and Board of Deans approval the recommendation was referred to the Board of Regents for final action. Without delay the Board of Regents acted favorably on the recommendation and on June 14, 1905, a resolution was passed declaring that the "title of the School of Applied Science be changed to "College of Applied Science" as recommended by Director Raymond and
President MacLean. It was further declared by the Regents that:

This College shall include the departments of civil, mechanical, electrical, mining, forest, and chemical engineering, descriptive geometry and drawing, and mechanics and such other departments of work in applied science as may from time to time be established.

The faculty of the College of Applied Science shall include the President of the University, all professors within the departments of the College and the heads of the University departments of mathematics, physics, chemistry, geology, botany, English, French and German.

Following the establishment of the College of Applied Science and the appointment of Professor Raymond as Dean, competent instructors were secured to head the newly created departments and fill other vacancies on the teaching staff. Most significant, perhaps, of the faculty appointments, at this time, were the appointments of Frederick G. Higbee to head the chair of Descriptive Geometry and Drawing, Arthur H. Ford to Professor and Head of the Department of Electrical Engineering, and Ernest L. Ohle to Acting Professor of Steam Engineering in charge of Mechanical Engineering.

The first formal meeting of the faculty of the new College was called to order by President MacLean on September 15, 1905. Attending the initial meeting were, Dean Raymond and Professors Ansley, Calvin, Ford, Higbee, Le Daum, Magowan, Ohle, Rockwood, Shimak, Smith, Wilder, and Wilson. At this meeting, the President, after a
brief introductory talk appointed a committee on permanent organization. This committee composed of Dean Raymond, and Professors Calvin and Wilson reported at the following meeting held on September 29, and recommended the adoption of the following plan of faculty organization.

I. That there be the following Standing Committees:
   1. Committee of 5 on courses of study.
   2. Committee on program.

II. That regular meetings of the Faculty be held bi-monthly on Fridays at 4:30 P.M. and that special meetings may be called by the President, or the Dean, or upon the request of five members of the faculty.

III. The assistant professors and instructors within the departments represented in this faculty, who give instruction to students of the college shall sit with the faculty without vote but shall be eligible to committee appointments.

IV. That the order of business for the regular meetings of the faculty shall be as follows:

   1. Reading the minutes
   2. Consideration of petitions
   3. Reports of committees
   4. Special orders
   5. Deferred business
   6. New business
   7. Adjournment

V. Though we thoroughly agree with the suggestion of the President that the Registrar should be recording secretary of all the faculties we cannot at present recommend that additional duties be imposed upon that office, we therefore, recommend the selection of a secretary from the membership of the faculty.
The recommendation of the committee on organization was adopted and remained substantially unchanged until March 12, 1916, when the faculty adopted the recommendation of a committee headed by Professor Higbee. By the committee it was recommended that section three be amended to read:

Other Professors, Associate Professors, Assistant Professors and Instructors of University departments who give instruction to students of the college may sit with the faculty without a vote and shall be eligible to committee appointments.

A second section of the report provided for an Executive Committee composed of the Dean of the College, and two members to be elected by the faculty.

After the adoption of the report submitted by the committee on faculty organization at the meeting on September 29, a committee on faculty regulations was appointed. This committee presented the following report through its chairman, Professor Ansley, on October 14, 1905.

1. Recitations and other exercises shall be graded from 0 to 10.

2. An average of 7.5 shall be required for passing in any subject.

3. Students making an average grade between 5 and 7.5 in any subject shall be marked conditioned.

4. Students making an average grade of below 5 in any subject shall be marked failed.

5. Deficiencies in laboratory work may be removed only by a satisfactory performance
of the deficient work during regular laboratory hours.

6. A student conditioned in first semester classroom work shall be given an opportunity to remove the condition by examination, at the pleasure of the department concerned, prior to the second week of the fourth quarter. Any such condition not removed within this specified time shall become a failure. Regular examinations for the removal of deficiencies shall be scheduled by the Program Committee at the beginning of the fourth quarter.

7. Conditions in second semester classroom work and failures in classroom work of either semester may be made up by examinations on dates set by the Program Committee, at the opening of the succeeding fall semester; but a student deficient in half the work of any year shall be required to repeat all the work of the year.

8. All deficiencies unremoved after the opportunity given at the opening of the school year may be removed only by repeating the subjects with regular classes.

9. In case of a conflict of hours of recitation of an advanced subject and a subject in which the student is delinquent, preference shall in general be given to the delinquent subject; and in case of conflict between the subjects in which the student may be delinquent preference shall be given to the one coming earliest in the course.

10. A student shall be marked 0 for any exercise from which he is absent unless excused by the Dean or President, in which case the student shall be given an opportunity at the pleasure of the instructor to make up the deficient exercise.

11. A student convicted of dishonesty in College work shall be expelled.

Although the faculty adopted the report as submitted by the committee on regulations it was soon found necessary to alter it by the adoption of a recommendation made by the faculties of the various colleges. Recogniz-
ing the need for a uniform marking system the conference of faculties recommended that "there be 3 passing grades, viz. A, B, and C; that the abbreviations Cond. and Fd. be used to characterize work not successfully accomplished."

With the faculty organized and regulations adopted to effect uniformity of action within the College of Applied Science and its relation to other colleges of the University, the purpose of the newly established College was announced. According to the statement published in March 1906, the College of Applied Science was

First, to provide courses of study at once broad, and particularly in the fundamental theories complete and thorough.

Second, to provide teachers accomplished in their several departments of engineering knowledge who shall see that the courses of study are faithfully and completely carried out; who shall interest themselves in the welfare of each student and inspire him with a spirit of work.

Third, to provide a sufficient equipment to properly illustrate and fix the principles and practice taught in the class room, and no more. It is not part of its purpose to make skilled mechanics, however worthy such a course may be, but to train engineers.

Every effort was made from the beginning to accomplish the purpose as stated and thus develop men by bringing out the best that was in them and preparing them to take their places among the country's foremost trained engineers. Recognized as one of the noblest professions which demanded men for the most part that were college
Dean Raymond sought to have it said by the employers of young graduates that "the best trained men are from Iowa." It was his desire to train engineers at Iowa to be not only locators and builders of great railroad systems and canals, or designers and builders of steam and electric locomotives, ships, bridges, buildings, water works and sewerage systems, machinery and great manufacturing plants, but also to be superintendents of great public works or presidents and general managers of leading railroad or industrial plants.

That students might be prepared to do the work required in the beginning engineering courses requirements for admission were established anew and implied substantially the completion of a four year high school course. This requirement included three years work in English; two years of one foreign language, with French or German being preferred; one year of history and civics; and mathematics through elementary algebra, and plane and solid geometry. Because solid geometry was a new requirement and many high schools did not include it in the course of study it was announced that "until 1907 provision will be made in the University for teaching solid geometry to those students who have been unable to present this subject for entrance." In addition to the required subjects indicated students seeking admission were required to offer sufficient work of high school level to
make up the equivalent of a four year course. This additional work, at the option of the candidate, might be selected from history, language or natural science. To obtain credit, however, in Physics or Chemistry, it was necessary to offer at least one full year of work, and the course in Chemistry must have included laboratory work.

Students of mature years were allowed to enroll in such subjects as their previous training would permit, with the understanding, however, that all entrance requirements would be satisfied before they presented themselves as candidates for a degree.

The requirements for admission as announced at the time the College of Applied Science was established remained substantially unchanged until 1917, despite some effort to have them made less demanding. Change, however, was made necessary when high schools in the state began to reduce requirements for graduation and no longer offered courses in advanced mathematics or two years of foreign language. To solve this problem the faculty of the College of Applied Science passed the following resolution, on October 12, 1917.

Whereas, it appears that in several high schools students are deprived by action of their boards of education of the opportunity of taking the second year of the foreign language which they have chosen; be it

Resolved, by the faculty of the College of Applied Science of the State University of Iowa,
subject to the concurrent action by the faculty of the College of Liberal Arts of the University and the faculties of the State Colleges at Ames and Cedar Falls, with the approval of the Iowa State Board of Education that in the cases of such students who have graduated from these high schools in 1918, one year in each of two foreign languages shall be considered as meeting the requirement in foreign language for admission without condition. 73

The resolution adopted by the faculty was considered by a Board of Secondary School Relations, representing the three state institutions. This Board after studying the problem made the proposal that foreign language be made an elective course and no longer be required for admission. The proposal was received by the faculty on February 8, 1918. Unwilling to abandon the foreign language requirement completely the faculty held action until requirements for admission to other leading colleges of engineering could be ascertained. On March 22, by a vote of eight to three the faculty decided to no longer require foreign language credits for admission to the College of Applied Science. At the same time, in view of the fact that students entering college were deficient in advanced algebra and solid geometry and because the College of Liberal Arts had dropped both from the required list it was:

Resolved, the Faculty of the State College concurring - that beginning with the school year 1918-19, the mathematics requirements for admission to the College of Applied Science of
the State University of Iowa and the Division of Engineering of the State College be the same as for entrance to the College of Liberal Arts.77

Final action determining the requirements for admission and the establishment of a definite relationship with the secondary schools of the state came on November 19, 1919. On that date a resolution adopted by a joint committee of fifteen representing the three state institutions was approved. According to the resolution it was decided,

that any graduate of any 4-year Iowa secondary school which is approved by the state department of Public Instruction should be admitted to such collegiate work as the graduate maybe prepared to pursue in the State University of Iowa, the Iowa State College of Agriculture and Mechanic Arts or Iowa State Teacher's College. 79

With entrance requirements being raised in 1905, and made comparable to those of other leading engineering colleges, effort was made to establish broad courses of study, secure teachers of high grade, and improve and increase the material equipment. The procedure or "policy of establishing broad courses and securing good men and machinery afterwards" was declared "justified" by Dean Raymond in his annual report to the President, in 1908. Herein he stated that the policy had resulted in giving "as strong courses in engineering as are offered anywhere in the country." The courses of study submitted by the committee and approved by both
the faculty and the Board of Regents, besides providing in each, the fundamental principles of all, enabled the student to specialize so far as it was deemed wise in an undergraduate course in civil, sanitary, mechanical, electrical, mining or chemical engineering. The following courses of study were adopted and announced in the first Announcement of the College of Applied Science, published in 1906. The odd numbers indicated work in the first semester and the even numbers work in the second semester. The letters "a" and "b" following the numbers indicated respectively the first and second halves of the semester.

CIVIL ENGINEERING

### FRESHMAN YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 101(102)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Mathematics (First year group A)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Drawing (Engin. 1)</td>
<td></td>
<td>5 hours</td>
</tr>
<tr>
<td>Descriptive geometry (Engin.2)</td>
<td></td>
<td>5 hours</td>
</tr>
<tr>
<td>Chemistry 3 and 25</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Surveying (Engin. 14)</td>
<td>17 hours</td>
<td>17 hours</td>
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### SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 121 (122)</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Mathematics (Second year group A)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Physics 3(4)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Mineralogy (Geol. 3)</td>
<td>2(\frac{1}{2}) hours</td>
<td>2(\frac{1}{2}) hours</td>
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<td>Geology 4</td>
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SOPHONORE YEAR (Cont'd)

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<thead>
<tr>
<th></th>
<th>First Semester</th>
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<tbody>
<tr>
<td>Botany 25</td>
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<tr>
<td>Surveying (Engin. 18)</td>
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</tr>
<tr>
<td>Topographical drawing (Engin. 5)</td>
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<tr>
<td></td>
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JUNIOR YEAR

<table>
<thead>
<tr>
<th></th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 131 (132)</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Mechanics (Physics 13)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Materials of Engineering (Engin. 22)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statics, (Engin. 19 (20) )</td>
<td>3 hours</td>
<td></td>
</tr>
<tr>
<td>Contracts (Engin. 21a)</td>
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<td></td>
</tr>
<tr>
<td>Contracts (Engin. 21a)</td>
<td>2½ hours</td>
<td></td>
</tr>
<tr>
<td>Hydraulics (Engin. 25b)</td>
<td>2½ hours</td>
<td></td>
</tr>
<tr>
<td>Water supply and sewerage (Engin. 28b)</td>
<td>2½ hours</td>
<td></td>
</tr>
<tr>
<td>Metallurgy (Chem. 14a)</td>
<td>1½ hours</td>
<td></td>
</tr>
<tr>
<td>Highways (Engin. 26a)</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td>Architecture (Engin. 31a)</td>
<td>1½ hours</td>
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</tr>
<tr>
<td>Water analysis (Chem. 45)</td>
<td>1½ hours</td>
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<tr>
<td>Astronomy and geodesy (108)</td>
<td>3 hours</td>
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<tr>
<td></td>
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SENIOR YEAR

<table>
<thead>
<tr>
<th></th>
<th>First Semester</th>
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</tr>
</thead>
<tbody>
<tr>
<td>English 141 (142)</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Electrical engineering 59 (6)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Structural design (Engin. 23 (24))</td>
<td>4 hours</td>
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<tr>
<td>Thermodynamics and prime movers (Engin. 39)</td>
<td>5 hours</td>
<td></td>
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<tr>
<td>Railroad engineering (Engin. 32a)</td>
<td>2½ hours</td>
<td></td>
</tr>
<tr>
<td>Economics 2b</td>
<td>2½ hours</td>
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</tr>
<tr>
<td>Bacteriology 21</td>
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<td></td>
</tr>
<tr>
<td>Thesis 100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 hours</td>
<td>16 hours</td>
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SANITARY ENGINEERING

The course in civil engineering is itself an excellent basis for the work of the sanitary engineer, but for those who wish to specialize in sanitary work a course has been arranged based on the
course in civil engineering, but introducing a more extensive study of bacteriology and water analysis, a course in biology, and a course in sanitary inspection, design and construction. These subjects replace astronomy and geodesy, metallurgy and architecture in the junior year, and one semester of structural design in the senior year, of the civil engineering course.

**MECHANICAL ENGINEERING**

**FRESHMAN YEAR**

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 101 (102)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics (First year group A)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Drawing (Engin. 1)</td>
<td>5 hours</td>
<td></td>
</tr>
<tr>
<td>Descriptive Geometry (Engin. 2)</td>
<td></td>
<td>5 hours</td>
</tr>
<tr>
<td>Chemistry 4, 26</td>
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<td>5 hours</td>
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<tr>
<td>Shopwork (Engin. 9)</td>
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<tr>
<td><strong>Total</strong></td>
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<td><strong>17 hours</strong></td>
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**SOPHOMORE YEAR**

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>English 121 (122)</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Mathematics (Second year group A)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Physics 3 (4)</td>
<td>5 hours</td>
<td>5 hours</td>
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<tr>
<td>Surveying (Engin. 15)</td>
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<tr>
<td>Shopwork (Engin. 10)</td>
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<td>Kinematics (Engin. 34 and 6)</td>
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<td>Machine drawing (Engin. 3)</td>
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<tr>
<td><strong>Total</strong></td>
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**JUNIOR YEAR**

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 131 (132)</td>
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<tr>
<td>Mechanics (Physics 13)</td>
<td>5 hours</td>
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<tr>
<td>Materials of engineering (Engin. 22)</td>
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<td>5 hours</td>
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<tr>
<td>Statics (Engin. 19)</td>
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<td>3 hours</td>
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<tr>
<td>Contracts (Engin. 21a)</td>
<td>2 3/4 hours</td>
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<tr>
<td>Hydraulics (Engin. 25b)</td>
<td>2 3/4 hours</td>
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<tr>
<td>Thermodynamics and heat engines</td>
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<td>5 hours</td>
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<tr>
<td>(Engin. 40)</td>
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<tr>
<td>Kinematics (Engin. 35 and 7)</td>
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<td>Advanced Shopwork (Engin. 12)</td>
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### JUNIOR YEAR (Cont'd)

<table>
<thead>
<tr>
<th></th>
<th>First Semester</th>
<th>Second Semester</th>
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</thead>
<tbody>
<tr>
<td>Metallurgy (Chem. 14a)</td>
<td></td>
<td>1½ hours</td>
</tr>
<tr>
<td>Hydraulic machinery (Engin. 46b)</td>
<td></td>
<td>1½ hours</td>
</tr>
<tr>
<td>Mechanical Laboratory (Engin. 42)</td>
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<td><strong>Total</strong></td>
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<td>17 hours</td>
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### SENIOR YEAR

<table>
<thead>
<tr>
<th></th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 141 (142)</td>
<td>1 hour</td>
<td>1 hour</td>
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<tr>
<td>Electrical engineering 59 (60)</td>
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<td>Heat engines (Engin. 41)</td>
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<tr>
<td>Machine design (Engin. 37 38a)</td>
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<tr>
<td>Mechanical Laboratory (Engin. 43 44)</td>
<td>2 hours</td>
<td>2 hours</td>
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<tr>
<td>Economics 2b</td>
<td>2 hours</td>
<td>2 hours</td>
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<tr>
<td>Heating and ventilating (Engin. 36a)</td>
<td>1 hour</td>
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<tr>
<td>Factory management (Engin. 36b)</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td>Thesis 100</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16 hours</td>
<td>16 hours</td>
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### ELECTRICAL ENGINEERING

Freshman and sophomore years same as in mechanical course

### JUNIOR YEAR

<table>
<thead>
<tr>
<th></th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 131 (132)</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Mechanics (Physics 13)</td>
<td>5 hours</td>
<td></td>
</tr>
<tr>
<td>Materials of engineering (Engin. 22)</td>
<td>5 hours</td>
<td></td>
</tr>
<tr>
<td>Electrical measurements (Physics 9)</td>
<td>3 hours</td>
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<tr>
<td>Electrical engineering (Engin. 51)</td>
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<tr>
<td>Electric circuit (Engin. 52)</td>
<td>4 hours</td>
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<tr>
<td>The electro chemistry 8</td>
<td>4 hours</td>
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</tr>
<tr>
<td>Contracts (Engin. 21a)</td>
<td>2½ hours</td>
<td></td>
</tr>
<tr>
<td>Hydraulics (Engin. 25b)</td>
<td>2½ hours</td>
<td></td>
</tr>
<tr>
<td>Metallurgy (Chem. 14a)</td>
<td>1½ hours</td>
<td></td>
</tr>
<tr>
<td>Hydraulic machinery (Engin. 46b)</td>
<td>1½ hours</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>17 hours</td>
<td>17 hours</td>
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### SENIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 141 (142)</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Thermodynamics and prime movers (Engin. 39)</td>
<td>5 hours</td>
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<tr>
<td>Dynamo electric machinery (Engin. 53 (54a))</td>
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<td>2½ hours</td>
</tr>
<tr>
<td>Machine design (Engin. 37)</td>
<td>3 hours</td>
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</tr>
<tr>
<td>Steam engine laboratory (Engin. 43)</td>
<td>2 hours</td>
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<tr>
<td>Electrical testing (Engin. 55 (56))</td>
<td>2 hours</td>
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<td>Telephone and telegraph (Engin. 62a)</td>
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<tr>
<td>Electrical power stations (Engin. 64b)</td>
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</tr>
<tr>
<td>Economics 2b</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>16 hours</strong></td>
<td><strong>13 hours</strong></td>
</tr>
</tbody>
</table>

### MINING ENGINEERING

#### FRESHMAN YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 101 (102)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Mathematics (first year group A)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Drawing (Engin. 1)</td>
<td>5 hours</td>
<td></td>
</tr>
<tr>
<td>Descriptive geometry (Engin. 2)</td>
<td>5 hours</td>
<td></td>
</tr>
<tr>
<td>Chemistry 3, 25</td>
<td>5 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Chemistry 40</td>
<td></td>
<td>3½ hours</td>
</tr>
<tr>
<td>Surveying (Engin. 16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17 hours</strong></td>
<td><strong>17½ hours</strong></td>
</tr>
</tbody>
</table>

#### SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 121 (122)</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Mathematics (second year group A)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Physics 3(4)</td>
<td>5 hours</td>
<td></td>
</tr>
<tr>
<td>Chemistry 39</td>
<td>3 hours</td>
<td></td>
</tr>
<tr>
<td>Electro chemistry S</td>
<td></td>
<td>4 hours</td>
</tr>
<tr>
<td>Geology 1 (2)</td>
<td>2 hours</td>
<td></td>
</tr>
<tr>
<td>Machine drawing (Engin. 3)</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17 hours</strong></td>
<td><strong>17 hours</strong></td>
</tr>
</tbody>
</table>
### JUNIOR YEAR

<table>
<thead>
<tr>
<th></th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanics (Physics 13)</td>
<td>5 hours</td>
<td></td>
</tr>
<tr>
<td>Materials of engineering (Engin. 22)</td>
<td></td>
<td>5 hours</td>
</tr>
<tr>
<td>Assaying (Chem. 52)</td>
<td></td>
<td>5 hours</td>
</tr>
<tr>
<td>Mineralogy (Geol. 31(32)</td>
<td></td>
<td>5 hours</td>
</tr>
<tr>
<td>Ore dressing (Engin. 75a)</td>
<td>2 1/2 hours</td>
<td></td>
</tr>
<tr>
<td>Hydraulics (Engin. 25b)</td>
<td>2 1/2 hours</td>
<td></td>
</tr>
<tr>
<td>Statics (Engin. 19(20) part)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Optical properties of crystals (Physics 11)</td>
<td>2 hours</td>
<td></td>
</tr>
<tr>
<td>Petrology (Geol. 11)</td>
<td>3 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17 hours</strong></td>
<td><strong>17 hours</strong></td>
</tr>
</tbody>
</table>

### SENIOR YEAR

<table>
<thead>
<tr>
<th></th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining (Engin. 77 (78)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Thermodynamics and prime movers (Engin. 39)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Electrical engineering (Engin.58)</td>
<td></td>
<td>5 hours</td>
</tr>
<tr>
<td>Metallurgy (Chem. 11 (12))</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Ore deposits (Geol. 33 (34)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Mining law</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Thesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16 hours</strong></td>
<td><strong>16 hours</strong></td>
</tr>
</tbody>
</table>

**THE COURSE IN CHEMICAL ENGINEERING**

The increasing activity in American manufacturing has created a demand for trained men to take charge of the management of processes which involve a knowledge of the principles of both chemistry and mechanical engineering for their successful operation. This course is intended to prepare men who wish to devote themselves to one of the chemical industries by laying such a foundation.
that their rise in a selected field may be rapid and permanent.

CHEMICAL ENGINEERING

Freshman year same as in mechanical engineering course

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 121 (122)</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Mathematics (second year group A)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Physics 5(4)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Mineralogy (Geol. 3)</td>
<td>2½ hours</td>
<td>2½ hours</td>
</tr>
<tr>
<td>Geology 4</td>
<td>2½ hours</td>
<td>3½ hours</td>
</tr>
<tr>
<td>Quantitative analysis 39(40)</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td>Machine drawing (Engin. 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>17 hours</strong></td>
<td><strong>17 hours</strong></td>
</tr>
</tbody>
</table>

JUNIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 131 (132)</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Mechanics (Phys. 13)</td>
<td>5 hours</td>
<td></td>
</tr>
<tr>
<td>Materials of Engineering (Engin. 22)</td>
<td>5 hours</td>
<td></td>
</tr>
<tr>
<td>Organic chemistry 53 (54)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Organic chemistry 55 (56)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Metallurgy (Chem. 11 (12)</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Electro Chemistry 8</td>
<td>4 hours</td>
<td></td>
</tr>
<tr>
<td>Contracts (Engin. 21a)</td>
<td>2½ hours</td>
<td></td>
</tr>
<tr>
<td>Hydraulics (Engin. 25b)</td>
<td>2½ hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>16 hours</strong></td>
<td><strong>15 hours</strong> 85</td>
</tr>
</tbody>
</table>

SENIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 141 (142)</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Industrial chemistry 19 (20)</td>
<td>3 hours</td>
<td>2½ hours</td>
</tr>
<tr>
<td>Electrical engineering 59(60)</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Thermodynamics and prime movers (Engin. 39)</td>
<td>5 hours</td>
<td></td>
</tr>
</tbody>
</table>
SENIOR YEAR (Cont'd)

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering chemistry</td>
<td>2 hours</td>
</tr>
<tr>
<td>Surveying (Engin. 16)</td>
<td>3½ hours</td>
</tr>
<tr>
<td>Factory management (Engin. 36b)</td>
<td>1 hour</td>
</tr>
<tr>
<td>Thesis 100</td>
<td></td>
</tr>
</tbody>
</table>

16 hours 15 hours

Although the courses of study adopted at this time for the several departments already established in the College of Applied Science were in the main complete and basic, they were very soon altered in accidental or substantial fashion by the addition or discontinuance of courses or by changes in course names and number. Characteristic of such changes were those effected by the adoption of Professor Highbee's recommendation, in 1908, that "one hour in Topographical Drawing and a one hour course in Stereotomy and Perspective be added to the junior year of Civil Engineering," or that of Professor Ford, in 1911 which

requested that the present courses in electrical engineering be modified by replacing the course in "electrical measurements," - Physics 27(28), 3 hours, by "Constant and variable electrical currents and electrical measurements," - Physics 27(28), 6 semester hours; and by reducing "hydraulics," - engineering 32 to 4 hours. 87

Changes in names and numbers of courses, with the course in each case remaining the same, was requested, in 1913, by Professor Highbee in the Department of Descriptive
Geometry and Drawing such courses to be announced as follows:

**FIRST SEMESTER**

<table>
<thead>
<tr>
<th>Course</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive Geometry</td>
<td>1a</td>
<td>5b</td>
</tr>
<tr>
<td>Engineering Drawing</td>
<td>5a</td>
<td>7b</td>
</tr>
<tr>
<td>Machine Drawing</td>
<td>9b</td>
<td>12a</td>
</tr>
<tr>
<td>Perspective</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SECOND SEMESTER**

<table>
<thead>
<tr>
<th>Course</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive Geometry</td>
<td>2a</td>
<td>4b</td>
</tr>
<tr>
<td>Engineering Drawing</td>
<td>6a</td>
<td>8b</td>
</tr>
<tr>
<td>Machine Drawing</td>
<td>10a</td>
<td>88</td>
</tr>
</tbody>
</table>

Perhaps the first course of study to be substantially changed was that adopted for the Department of Mining Engineering. The change was effected, on February 6, 1906, when the faculty of the College of Applied Science upon recommendation adopted the following course of study.

**SOPHOMORE YEAR**

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Military Drill</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>English 121 (122)</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Mathematics (2d Year, Sequence A),</td>
<td>5 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Physics 3 (4),</td>
<td>6 hours</td>
<td>6 hours</td>
</tr>
<tr>
<td>Geology 1 (2),</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Qualitative Analysis (Chem. 103)</td>
<td>3 hours</td>
<td></td>
</tr>
<tr>
<td>Quantitative Analysis (Chem. 152)</td>
<td></td>
<td>3 hours</td>
</tr>
<tr>
<td></td>
<td>18 hours</td>
<td>18 hours</td>
</tr>
</tbody>
</table>
### JUNIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 131 (132)</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Mechanics (Phys. 13)</td>
<td>5 hours</td>
<td></td>
</tr>
<tr>
<td>Metallurgical Analysis (Chem.155)</td>
<td>4 hours</td>
<td></td>
</tr>
<tr>
<td>Mineralogy (Geol. 11)</td>
<td>5 hours</td>
<td></td>
</tr>
<tr>
<td>Physical Chemistry 251</td>
<td>3 hours</td>
<td></td>
</tr>
<tr>
<td>Economics 6</td>
<td></td>
<td>3 hours</td>
</tr>
<tr>
<td>Material of Engineering (Engin.58)</td>
<td></td>
<td>5 hours</td>
</tr>
<tr>
<td>Assaying (Chem. 72a)</td>
<td></td>
<td>2 hours</td>
</tr>
<tr>
<td>Ore dressing (Engin. 142)</td>
<td></td>
<td>3 hours</td>
</tr>
<tr>
<td>Petrology (Geol. 32)</td>
<td></td>
<td>4 hours</td>
</tr>
<tr>
<td></td>
<td>18 hours</td>
<td>18 hours</td>
</tr>
</tbody>
</table>

### SENIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 141 (142)</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Mining Engin, 143 (144)</td>
<td>4 hours</td>
<td>5 hours</td>
</tr>
<tr>
<td>Metallurgy Chem. 73(74)</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Economic Geology Geol. 338, (34a)</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Electrical engineering (Engin.127)</td>
<td>5 hours</td>
<td></td>
</tr>
<tr>
<td>Surveying (Engin. 23)</td>
<td>3 hours</td>
<td></td>
</tr>
<tr>
<td>Contracts (Engin. 36a)</td>
<td></td>
<td>2½ hours</td>
</tr>
<tr>
<td>Geological surveys (Geol. 36b)</td>
<td></td>
<td>2 hours</td>
</tr>
<tr>
<td>Thesis 200</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18 hours</td>
<td>15½ hours</td>
</tr>
</tbody>
</table>

The new course of study failed to give the necessary impetus to mining engineering and unlike other departments in the College of Applied Science it lagged in its development. For this reason there was no particular objection voiced by the faculty of that College, in the Spring of 1912, when the Board of Education in the name of "economy" announced its intention to discontinue the department of mining engineering. The announcement,
however, brought an immediate cry of protest from the science professors in the College of Liberal Arts as they declared that the courses in mining engineering were essential to their departments. By their protests the professors were unable to prevent the abolition of the department but they did succeed in bringing about a transfer of all the instruction to the department of chemistry. As an economy measure the abolition of the department saved nothing "except space occupied in the University catalogue" yet it succeeded in abolishing a degree and discouraging "students from coming to the University to take work which is still given by the same men who gave it in the past."

First increase in the departmental organization was effected by the establishment of a Department of Mechanics of both the College of Liberal Arts and the College of Applied Science on October 7, 1909. Headed by Mr. A. G. Smith, following his transfer from the Physics department the newly established department did not operate successfully and upon faculty recommendation it was abolished on September 7, 1911. The abolition of the department of the two colleges was promptly followed by the establishment of the Department of Mechanics in the College of Applied Science which endured until 1914 when the department of Mechanics and Hydraulics was established, and headed by Sherman M.
Woodward. At the same time upon the recommendation of Dean Raymond a department of Structural Engineering was established and in "recognition of his long and valuable service Professor Lambert," was made the head, a title he retained until 1922 when he was named head of the Civil Engineering Department.

Because of the specifically technical nature of the courses of study adopted in 1906, the need for a course that would provide a broader and more general training, than could now be provided, was soon recognized and in accordance with his policy to offer an enriched and complete curricula Dean Raymond recommended a "General Engineering Course" to the faculty on February 26, 1909. Adopted by the faculty the course was designed to enable students to secure a good foundation in mathematics and the physical sciences, in modern languages and in certain other subjects of cultural or utilitarian value. In addition to being advantageous to persons expecting to enter the commercial or business department of any manufacturing or industrial enterprise, or general commerce, it was an excellent basis for a five year course in engineering since with a proper selection of electives in the general course the addition of a fifth year of prescribed work would complete any one of the engineering courses and secure the degree of Bachelor of Engineering.
Because of the combination of technical work given in the College of Applied Science and the electives in economics given in the College of Liberal Arts, and in the law of contracts, sales and commercial paper, in the College of Law, the course was considered an excellent training for any business man and was highly recommended for students proposing to follow the profession of engineering and able to give five years in preparation. The course was announced as follows:

**SOPHOMORE YEAR**

The student selects the work prescribed for the sophomore year of some one of the regular engineering courses.

**JUNIOR AND SENIOR YEARS**

A minimum of 66 credits, as follows Required:

- **Mechanics** (Phys. 13), 5 hours
- **Materials** (Engin. 57), 5 hours
- **Statics** (Engin. 52), 5 hours
- **Steam Engines and Boilers** (Engin.87), 5 hours
- **Hydraulics** (Engin. 31), 5 hours
- **Electrical Engin.** (Engin. 127), 5 hours
- **English** 4 hours
- **German** 12 to 22 hours or
- **French** 10 to 16 hours

**Elective:**

Subject to the approval of the Dean, any course in the Colleges of Liberal Arts and Applied Science for which the student is prepared or in the College of Law on payment of the necessary additional fee, 10 to 28 hours. 103

In addition to providing a general engineering course successful effort was made to set up a combined
courses in Liberal Arts and Engineering. Because many of the fundamental subjects of the engineering courses were taught in the College of Liberal Arts, the faculty of the College of Applied Science, in accordance with Dean Raymond's recommendation, voted on September 27, 1907, that a committee should be appointed to confer with a similar committee from the College of Liberal Arts with reference to arranging a combined engineering and liberal arts course. In the conference it was agreed that the faculty of the College of Liberal Arts would accept for credit, toward the degree of Bachelor of Arts, thirty semester hours or the equivalent of one year's work offered exclusively in the College of Applied Science, the faculty, however, determining from time to time what subjects should be so credited. For liberal arts the following requirements were maintained:

FRESHMAN YEAR

<table>
<thead>
<tr>
<th></th>
<th>First Sem.</th>
<th>Second Sem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>English (rhetoric)</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Speech</td>
<td>1 hr.</td>
<td>1 hr.</td>
</tr>
<tr>
<td>Foreign language (French, German, Greek, Italian, Latin, or Spanish)</td>
<td>4 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Note 1, p. 109)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective (American government, American history, economics, European history or logic and ethics)</td>
<td>4 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Chemistry</td>
<td>4 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td></td>
<td>16 hrs.</td>
<td>16 hrs.</td>
</tr>
</tbody>
</table>
### SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English literature</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Foreign language (note 3, p. 109)</td>
<td>3 or 4 hrs.</td>
<td>3 or 4 hrs.</td>
</tr>
<tr>
<td>Mathematics</td>
<td>4 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Mechanical drawing</td>
<td>2 or 3 hrs.</td>
<td>3 or 2 hrs.</td>
</tr>
<tr>
<td>Shopwork</td>
<td>3 or 2 hrs.</td>
<td>2 or 3 hrs.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15 or 16 hrs.</strong></td>
<td><strong>15 to 16 hrs.</strong></td>
</tr>
</tbody>
</table>

### JUNIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>5 hrs.</td>
</tr>
<tr>
<td>Physics</td>
<td>5 hrs.</td>
</tr>
<tr>
<td>Surveying</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>Descriptive Geometry</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>Elective in liberal arts (note 1)</td>
<td>2 hrs.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16 hrs.</td>
</tr>
</tbody>
</table>

### SENIOR YEAR

In addition to work in the College of Applied Science, the following liberal arts courses are required: Economics, 6 sem. hrs.; physics 5 hrs.; geology, 3 hrs.; mathematics, 6 hrs.; electives, 4 to 6 hrs.

Note 1: Students whose grades have been sufficiently high may obtain permission by petition to anticipate the requirement in economics listed in the fourth year and to substitute a liberal arts elective for it in the fourth year. 107

The combined course in liberal arts and applied science gave added enrichment to the engineering curricula and greater opportunity to the students of the college. By a proper selection of electives offered in the College of Liberal Arts it was possible for a student to earn the
degree Bachelor of Arts at the end of the fourth year and Bachelor of Engineering at the end of the fifth year.

The wisdom and success of the combined course was evidenced with a certain finality on March 5, 1914, by the faculty approval of the recommendation that the combined course in arts and engineering be extended and "established jointly with the Liberal Arts Colleges of the State and the College of Applied Science at the State University." A committee was appointed to work out the details for the extension of the combined course, which according to Dean Raymond was the extension of a policy inaugurated previously between the Colleges of Liberal Arts and College of Applied Science. On April 25, 1914, the Committee recommended the following plan, which Grinnell College agreed to accept and proposed to advertise in its catalogue. In the report to the faculty it was stated:

Arrangements have been made with the State University whereby students who have properly selected their studies in Grinnell may after graduation complete the general course in engineering at the State University in one year. Students who plan to take advantage of the arrangement should advise with the Head of the Department of Mathematics or Physics.

The fifth year is to be outlined by the Faculty of the College of Applied Science in the University. The work proposed to be offered by Grinnell College is as follows:

"The General Engineering Course. Four Years at Grinnell, one Year at Iowa City."
### Work to be given by Grinnell College

<table>
<thead>
<tr>
<th>Subject</th>
<th>Courses</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>A, 1, 2, 11</td>
<td>19 hrs.</td>
</tr>
<tr>
<td>Physics</td>
<td>1, 2, 3, 4, 11, 12</td>
<td>12 hrs.</td>
</tr>
<tr>
<td>Chemistry</td>
<td>1 and 2</td>
<td>6 hrs.</td>
</tr>
<tr>
<td>English</td>
<td>A</td>
<td>6 hrs.</td>
</tr>
<tr>
<td>Foreign Language</td>
<td></td>
<td>16 hrs.</td>
</tr>
<tr>
<td>Mechanical Drawing</td>
<td>1, 4, 15, 16</td>
<td>9 hrs.</td>
</tr>
<tr>
<td>Surveying</td>
<td>13, 14</td>
<td>6 hrs.</td>
</tr>
<tr>
<td>History, Political Science or Economics</td>
<td></td>
<td>6 hrs.</td>
</tr>
<tr>
<td>Philosophy</td>
<td></td>
<td>6 hrs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>96 hrs.</td>
</tr>
</tbody>
</table>

### Prescribed for Fourth Year

<table>
<thead>
<tr>
<th>Subject</th>
<th>Courses</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive Geometry</td>
<td>Engin. 21, 22</td>
<td>6 hrs.</td>
</tr>
<tr>
<td>Applied Electricity</td>
<td>Phys. 13, 14, 22</td>
<td>9 hrs.</td>
</tr>
<tr>
<td>Mechanics</td>
<td>Phys. 21 (See 11-12 above)</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Hydraulics</td>
<td>Engin. 25, 26</td>
<td>6 hrs.</td>
</tr>
<tr>
<td>Strength of Materials</td>
<td>Engin. 23, 24</td>
<td>6 hrs.</td>
</tr>
<tr>
<td>Stresses in Framed Structures</td>
<td>Engineering to be given</td>
<td>4 hrs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>34 hrs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>86 hrs.</td>
</tr>
<tr>
<td>Total prescribed</td>
<td></td>
<td>120 hrs.</td>
</tr>
</tbody>
</table>

**Major:** Physics  **Minor:** Mathematics  112

The faculty adopted the Committee report and the liberal arts course on May 15, 1914, and on June 14, Dean Raymond in a report to the President of the University and the Board of Education in reference to the Coordination of the Colleges of Liberal Arts of Other Institutions and the College of Applied Science of the
For your information I have to report that the faculty of the College of Applied Science on Friday, the 15th of May, adopted an arrangement of studies combining college courses in arts and engineering, by which it will be possible for a student to attend any one of the accredited colleges of the state for from three to four years, and the College of Applied Science of the State University of Iowa for from one to three, securing, according to the time of attendance, a degree from the arts college attended first and a professional degree in engineering from the College of Applied Science.

The arrangement of studies outlining the courses of study to be given jointly by the Colleges of Liberal Arts and the College of Applied Science and leading to an arts degree and a degree of engineering was submitted to the Board of Education as follows:

First three years to be given in College of Liberal Arts.

Prescribed:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics, including differential and integral calculus</td>
<td>20 hrs.</td>
</tr>
<tr>
<td>Physics</td>
<td>12 hrs.</td>
</tr>
<tr>
<td>Chemistry, including Qualitative Analysis</td>
<td>10 hrs.</td>
</tr>
<tr>
<td>English</td>
<td>10 hrs.</td>
</tr>
<tr>
<td>French or German</td>
<td>6 - 16 hrs.</td>
</tr>
<tr>
<td>Engineering Drawing</td>
<td>5 hrs.</td>
</tr>
<tr>
<td>Surveying</td>
<td>3 hrs.</td>
</tr>
</tbody>
</table>

Electives: 14 - 20 hrs.

Total 90 - 96 hrs.

Note 1. Students who enter with two years of preparatory French or German and who elect the same language in college will be required to elect 6 hrs. Students without previous preparation
will be required to elect 16 hrs. Students who elect either language in which they have some preparation but less or more than two years will be required to elect as many hours as the head of the language department concerned may determine.

Note 2. Recommended elective subjects.

Extra modern language
History
Government
Minerology
Economic Geology
Metallurgy
Economics
Botany (Timber Technology)
Chemistry (Quantitative Analysis).

Fourth Year to be given in College of Applied Science

(The credits earned to be allowed in the College of Liberal Arts toward an appropriate degree, preferably Bachelor of Arts)

Prescribed:

Analytic mechanics 5 hrs.
Hydraulics 4 hrs.
Mechanics of materials 5 hrs.
Descriptive Geometry 6 hrs.
Electricity 6 hrs.
Elective, selected with the approval of the Dean 9 hrs.

Total 34 hrs.

Note: It is understood that the electives during the four years must be so chosen as to satisfy the particular requirements of whatever college is to give the liberal arts degree at the end of the fourth year.

It is understood, also, that transpositions of required subjects of the first three and fourth years may be made to meet the convenience of requirements of the colleges of Liberal Arts. Correspondence
of such transpositions should be had with the Dean of the College of Applied Science.

Fifth Year to be given in the College of Applied Science

At its conclusion, the graduate is to receive the degree of Bachelor of Engineering.

Prescribed:

- Shop work 5 hours
- Stresses in framed structures 5 hours
- Electrical engineering 6 hours
- Kinematics and elementary machine design 6 hours
- Steam and other heat engines 6 hours

Electives, selected with approval of the Dean 7 hours

Total 34 hours

Note: Colleges fully prepared to give the entire prescribed work of the four years may do so and the College of Applied Science will receive for the work of the fifth year those graduates from such colleges who have covered prescribed work and approved electives for the four years. A sixth year of specialized work to be selected by the student with the approval of the dean and the head of the department concerned will lead to a professional degree.

After submitting the arrangement of studies with the special notes of explanation Dean Raymond stated that:

Grinnell College has already voted to cooperate on this basis and will advertise the arrangements in the forthcoming catalogue. Coe College is considering the matter favorably, and it is expected to put the arrangement in force the coming year. Other colleges of the State are now considering the matter, and the presidents of two of them have declared themselves to be in favor of the arrangement.

I believe this is the first formal step in
coordinating the work of the colleges of the state with the State University and a step which we hope will lead to more broadly trained engineers in Iowa as well as a closer and more friendly relation between the colleges of the state and the University. 116

The report of the Dean, upon the recommendation of President MacBride was unanimously adopted by the Board of Education, on June 14, 1914, and very soon other Colleges, notably Cornell, Coe and Morningside followed the example of coordination in which Grinnell was the pioneer.

Not only were those in charge of Engineering in the College of Applied Science interested in extending the opportunity for the study of engineering; they were equally, if not more, interested in making the courses complete and thorough; comparable in every way to those offered in the leading engineering colleges of the country. For this reason they sought and encouraged a "new arrangement" in the course of study. In 1915, it was announced that an arrangement of the course of study whereby less specialization would be required was being considered and that following its adoption all students would be instructed in the fundamental principles of all the branches of engineering taught in the University.

The new arrangement as contemplated was put into effect in 1918, after the expressed opinions of practicing engineers assured the faculty that the four year course should be much less specialized than had been common and much
stronger in the fundamental principles of all branches of engineering. With this in mind, therefore, the curricula was altered so that the work taken during the first three years was the same in the curricula of civil, mechanical, and electrical engineering. Work in the fourth year was differentiated only to the extent of about two thirds of the work taken during that year. Of necessity the course in chemical engineering, being a combination of a strong course in chemistry and a reasonably strong course in mechanical engineering, was differentiated earlier and after 1916 required five years for its completion. The five year course in chemical engineering adopted by the faculty upon the recommendation of Professor Rockwood, on March 27, 1916, was announced for the first time in the University Catalogue, as follows:

**FIRST YEAR**

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Military Drill</td>
<td>1 hour</td>
</tr>
<tr>
<td>Mathematics</td>
<td>5 hours</td>
</tr>
<tr>
<td>Chemistry</td>
<td>5 hours</td>
</tr>
<tr>
<td>English</td>
<td>2 hours</td>
</tr>
<tr>
<td>Drawing</td>
<td>3 hours</td>
</tr>
<tr>
<td>Shopwork</td>
<td>2 hours</td>
</tr>
<tr>
<td></td>
<td>18 hours</td>
</tr>
</tbody>
</table>

**SECOND YEAR**

<table>
<thead>
<tr>
<th>Military Drill</th>
<th>1 hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>5 hours</td>
</tr>
<tr>
<td>German</td>
<td>5 hours</td>
</tr>
</tbody>
</table>
### SECOND YEAR (Cont'd)

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualitative Analysis</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Descriptive Geometry</td>
<td></td>
<td>5 hours</td>
</tr>
<tr>
<td>English</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Economics</td>
<td>3 hours</td>
<td></td>
</tr>
<tr>
<td>Theory of Analytical Chemistry</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18 hours</td>
<td>19 hours</td>
</tr>
</tbody>
</table>

### THIRD YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Training</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>German</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Organic Chemistry</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Physics</td>
<td>6 hours</td>
<td>6 hours</td>
</tr>
<tr>
<td>Quantitative Analysis</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
</tbody>
</table>

### FOURTH YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Training</td>
<td>1 hour</td>
<td>1 hour</td>
</tr>
<tr>
<td>Metallurgy</td>
<td>2 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Mechanics</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Materials</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Machine design</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Kinematics</td>
<td>3 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Physical Chemistry</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>English</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18 hours</td>
<td>18 hours</td>
</tr>
</tbody>
</table>

### FIFTH YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Chemistry</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Engines and Boilers</td>
<td>5 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Statics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Electricity</td>
<td>3 hours</td>
<td>3 hours</td>
</tr>
<tr>
<td>Gas Analysis</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 hours</td>
<td>16 hours</td>
</tr>
</tbody>
</table>
In addition to the course of study the faculty also adopted the following recommendations submitted by the Professor of Chemistry.

1. That there be one trip of inspection for the sophomore year;

2. That there be one six weeks period of Summer Session work in some industrial plant;

3. That for the degree to be given on the completion of the fifth year at least two trips after the sophomore year and two periods of industrial employment of six weeks each, be required;

4. That at the option of the faculty three hours of additional University credit may be substituted for each of the six weeks periods of industrial work;

5. That a prescribed amount of reading be required of the student in the summer vacation.

The adoption and inauguration of the five year course in chemical engineering by the University of Iowa gave the institution "perhaps the most complete undergraduate course in chemical engineering now offered in the country" and it was expressive of a trend in engineering education as well as a feeling that was growing quite generally among college teachers of engineering who for some years past had been of the opinion that the four year college course in engineering was insufficient preparation for those men who expected to practice the profession. Washington University at St. Louis, and the
Universities of Missouri and Minnesota had established a five year course but because of the decline in enrollment its retention was of short duration and after the rather unhappy experience it was abandoned and the four year course reestablished. At Iowa, however, a growing number of students continued to take the chemical engineering course in stead of the four year course in the same branch offered in other institutions. Worthy of note is the fact that although a degree of Bachelor of Science was given at the end of the fourth year and the fifth year was taken in the Graduate College, eight years after the course was adopted only one student had failed to return to take the work offered in the fifth year. Knowing the distinctly superior quality of the course at Dartmouth, where the five year course had been required since 1893, and aware of the trend at the University of Michigan which had secured permission to introduce the five year course and was now making plans for its introduction the technical group of the College of Applied Science faculty, determined to keep engineering at Iowa in a prominent place and therefore, on April 22, 1921, announced that according to the faculty's judgment,

1. It is desirable to establish five year engineering courses, the first year of which should be given in the College of Liberal Arts and no specialization made (except in courses in chemical engineering) until the fifth year; the establishment of such five year courses being con-
sidered as a preliminary step toward the establishment of six year courses.

2. It is desirable first to make an effort to have the American Engineering Council of Federated American Engineering Societies establish standards of engineering and education for engineering colleges of different grades, and to rate the engineering colleges of the country in accordance with the classification adopted.

This expression of the faculty's mind in regard to the time given to the engineering courses was, at once, evidence of a progressive and courageous spirit. The College of Applied Science already had an enviable reputation because of the high grade of work its graduates performed and the leading positions they had taken but the faculty believed that by the five year curricula a still more attractive and valuable college training could be provided for the "ambitious, energetic, and intelligent young man of Iowa who desired to rise to positions of leadership in the engineering profession."

Considerations which prompted the faculty to desire and ultimately adopt a five year curricula were stated in the following way by Dean Raymond. "The engineer of today," he declared,

is being called on to solve problems that are not strictly engineering problems. His training has taught him how to analyze a problem, and how to proceed to its solution, whether the problem be one of engineering, of business or public administration. And so the engineer is being called on to take responsible positions in public affairs, and if he would appear to
advantage in such positions he must know how to write, and how to speak, as well as how to analyze and solve the problems that may arise. He must have that general education which will put him on the level with the men with whom he must be associated, men who have been trained in colleges of law and the world of affairs.

Thus it is essential that the engineer who is to become a leader in his profession and in the community in which he lives, - a standing which every engineer should be ambitious to obtain, no matter what his special line of work maybe - must have that general fundamental technical training that will enable him to design and supervise, and operate, those works of great magnitude in the design and construction and operation of which all of the so called branches of engineering have a part.

Prompted by such considerations to make the change which entailed the substitution of a five year curricula for that requiring only four years for completion the faculty of the College of Applied Science gave little heed to the fact that at Columbia, where engineering had been established on practically a graduate basis, by requiring three years of college preparation in Arts and Science followed by three years in the engineering school, it was reported that authorities were considerably disturbed because there were only two students enrolled in the fifth year in the Department of Mechanical Engineering and the enrollment which numbered close to one thousand engineering students before the six year course was introduced now totaled only one hundred and twenty five with but five or six hundred in the entire University, planning to study engineering.
The marked decrease in attendance at Columbia as well as at the University of Minnesota and Missouri indicated the great difficulty encountered by individual schools in effecting the change and showed clearly that the nature of the change demanded the cooperation of engineering schools generally. Convinced of the need for cooperation between the two Iowa engineering schools Dean Raymond in a letter under date of February 21, 1922, suggested the change to Dean Anson Marston of Iowa State College. Dean Marston expressed his desire to see such a change effected in engineering education but feared the consequences and effects upon the Iowa schools unless the change were made in all the leading engineering colleges of the middle west. As a solution to the problem the Dean of the Division of Engineering at Iowa State College proposed "a conference at Chicago, in May of the engineering deans of the best engineering schools in Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Missouri, Iowa, Nebraska, Kansas and possibly Kentucky, to talk over the situation." The calling of such a conference met with the approval of Dean Raymond, Dean Ferguson of Nebraska and a number of other deans whom he contacted. In accordance with Dean Marston's suggestion a letter signed by himself and Deans Raymond and Ferguson was sent on May 3, to the Dean or Director of twelve leading engineering colleges located
in the middle west. After extending an invitation to attend a conference of "deans of engineering" in Chicago, Illinois, on May 19, 1922, "for a preliminary discussion" of the five and six year engineering courses it was stated that there would "be no rigid program for the conference." It was proposed, however,

to start the conference by choosing a chairman and secretary, and then calling upon each dean of engineering present (or his duly authorized representative) to express his views upon the following questions:

1. Is it desirable that the present four year engineering courses be extended to five or to six years:
   a. For all engineering students?
   b. For a considerable fraction of the engineering students?

2. Is it possible to secure concerted action by substantially all the institutions represented at this conference in regard to the above questions?

3. If such concerted action is possible, are the number and character of institutions represented at this conference sufficient reasonably to assure the success of such concerted action?

4. In case five or six year engineering courses should be agreed upon as desirable, what would be their general features?

5. In case five or six year engineering courses should be agreed upon as desirable and concerted action thereon should be thought feasible and reasonably sure of success, should there be an attempt to secure uniformity of curriculums in the separate schools?

The conference was attended by the Deans and Administrative officers of fourteen of the principal
That in order to meet the constantly enlarging responsibilities of engineering profession the favor an advance in engineering education at this time that shall provide five years of collegiate training for those engineering students whose aim is to be qualified to take positions among the creative leaders in the profession, and that such advance shall be made in substantial accordance with the following plan:

1. Remodel the present four year engineering curriculums by substituting a substantial proportion of humanistic and fundamental subjects in place of an equivalent amount of advanced technical work.

It is desirable that so far as possible the curriculums in the different branches of engineering shall be sufficiently uniform to permit students to defer their final choice of a specialty at least to the end of the second year.

2. Add a fifth year of advanced work mostly or wholly technical and specialized to such extent as desired.

3. The first four years of work shall lead to a bachelor's degree and the fifth to an advanced degree in engineering.

The faculty of the College of Applied Science was represented at the conference and was "fully in accord with the spirit of the resolutions" adopted. Moved by the results obtained from an investigation of the demands made by organized industry upon the graduates from engineering colleges and encouraged by the resolutions adopted by the conference of deans on May 19, the faculty acted upon
the advice of its own alumni already engaged in successful practice and reorganized the four year courses in civil, electrical and mechanical engineering. By this reorganization the four year course was greatly strengthened by adapting it to prepare the young engineer not only for that branch of engineering which he perhaps wished to pursue, but also for that leadership in the community in which he may live and which was fast becoming the position of engineers with the proper background of a liberal and technical education.

Following the reorganization the degree Bachelor of Science was conferred on those completing the four year course and a high degree of specialized work was offered during the fifth year for "those who are ambitious to excel early in a particular field." On completion of the fifth year the professional degree of civil engineer, electrical engineer, or mechanical engineer was granted. With ten options to select from in the fifth year, by a proper choice of electives, it was possible for a student to prepare himself for early specialization in any one of the following branches of engineering:

- Structural engineering
- Hydraulic engineering
- Transportation engineering
- Electric Machine Design and Operation
- Electric communication, covering telegraph, telephone and radio communication.
- Electric power plant design and operation
- Power engineering, covering engine design and operation and steam power plant design and operation
General mechanical engineering
Automotive engineering, covering all forms
of internal combustion engines, auto­mobile design, the mechanics of aviation,
and aeroplane design.

In addition to these there is one option
designed to give advance training in the funda­mentals of all three of the branches of civil, electrical, and mechanical engineering, pre­paring the graduate much better than he can be prepared in four years for executive and ad­ministrative positions in the great industries
of the country.

Proposing to use every effort to induce entering
students to look forward to a college of five years in
accordance with the reorganized plan and with freshmen
indicating their desire for the longer course the faculty
of the College of Applied Science on June 1, 1923, became
among the first in the middle west to officially adopt that
broader curriculum that practically all faculties and
employers of engineering graduates had recognized for some
time to be desirable. Not including chemical engineer­ing and with subjects of the fifth year differentiated into
eleven special fields the following outline of a five year
course in engineering was proposed:

FIRST YEAR

<table>
<thead>
<tr>
<th>Subject</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Public Speaking</td>
<td>1 hr.</td>
<td>1 hr.</td>
</tr>
<tr>
<td>Mathematics</td>
<td>4 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Chemistry</td>
<td>4 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Drawing</td>
<td>2 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>or</td>
<td>3 hrs. or 2 hrs.</td>
<td></td>
</tr>
</tbody>
</table>
FIRST YEAR (Cont'd)

<table>
<thead>
<tr>
<th>Subject</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shopwork</td>
<td>3 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>or</td>
<td></td>
<td>2 hrs. or 3 hrs.</td>
</tr>
<tr>
<td></td>
<td><strong>17 hrs.</strong></td>
<td><strong>17 hrs.</strong></td>
</tr>
</tbody>
</table>

SECOND YEAR

<table>
<thead>
<tr>
<th>Subject</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Calculus</td>
<td>4 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Des. Geom.</td>
<td>(4) hrs. or 4 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Surveying</td>
<td>4 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Physics (Mech., Heat, Sound, Light)</td>
<td>4 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Eng'r'g. Problems</td>
<td>(2) hrs. or 2 hrs.</td>
<td>2 hrs. or (2)hrs.</td>
</tr>
<tr>
<td>Machine Drawing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>17 hrs.</strong></td>
<td><strong>17 hrs.</strong></td>
</tr>
</tbody>
</table>

THIRD YEAR

<table>
<thead>
<tr>
<th>Subject</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mech. &amp; Mater.</td>
<td>4 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Physics (Elect.)</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Diff. Equations</td>
<td>(2) hrs. or 2 hrs.</td>
<td>(3) hrs. or 3 hrs.</td>
</tr>
<tr>
<td>Economics</td>
<td>(3) hrs. or 3 hrs.</td>
<td>(5) hrs. or 5 hrs.</td>
</tr>
<tr>
<td>Heat Engines</td>
<td>5 hrs. or (5)hrs.</td>
<td>6 hrs.</td>
</tr>
<tr>
<td>Elective *</td>
<td>6 hrs.</td>
<td>6 hrs.</td>
</tr>
<tr>
<td></td>
<td><strong>18 hrs.</strong></td>
<td><strong>18 hrs.</strong></td>
</tr>
</tbody>
</table>

*Of the 22 semester hours of elective, 8 may be advanced military science, and not more than 4 may be physical training, but not both military Science and Physical Training may be elected. If military science is chosen it must be chosen in the third year and continued thru the third and fourth years. Physical training may be elected any semester of the third or fourth years, but not more than 1 sem.hr. in any semester. The remaining electives may be chosen for departments of Liberal Arts subject to the approval of the Executive Committee of the College of Applied Science. It is preferred that the electives be from the departments in which the student has no prescribed work, but some extension in arts departments in which the prescribed work is small in amount will be permitted.
### FOURTH YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine Design</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Hydraulics</td>
<td>3 or (3) hrs.</td>
</tr>
<tr>
<td>Business Law</td>
<td>0 or 2 hrs.</td>
</tr>
<tr>
<td>Kinematics</td>
<td>2</td>
</tr>
<tr>
<td>Accounting</td>
<td>(3) or 3 hrs.</td>
</tr>
<tr>
<td>Electromechanics</td>
<td></td>
</tr>
<tr>
<td>or Thermodynamics</td>
<td>0</td>
</tr>
<tr>
<td>R. R. Engineering</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>5 hrs</td>
</tr>
<tr>
<td>Stresses in Struct.</td>
<td>0</td>
</tr>
<tr>
<td>Elective*</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>18 hrs.</td>
</tr>
</tbody>
</table>

Degree Bachelor of Science.

### FIFTH YEAR

**General Engineering**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. R. Engineering or</td>
<td></td>
</tr>
<tr>
<td>Thermodynamics or</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Electromechanics</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Design of Static Structures</td>
<td>5 hrs.</td>
</tr>
<tr>
<td>Roads</td>
<td>1 hr.</td>
</tr>
<tr>
<td>Advanced Surveying</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Hydraulic Machinery</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>English</td>
<td>(2)hrs.</td>
</tr>
<tr>
<td>The Public Utility</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>The Public Utility</td>
<td>1 hr.</td>
</tr>
<tr>
<td>Sanitary Engineering</td>
<td>1 hr.</td>
</tr>
<tr>
<td>Thesis</td>
<td>0 hrs.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>17 hrs.</td>
</tr>
</tbody>
</table>


### Hydrulaic Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanitary Eng'rg.</td>
<td>1 hr.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Structural Design</td>
<td>5 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Roads</td>
<td>1 hr.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Probabilities &amp; Least Squares</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Hydrology</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Water Power</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Irrigation &amp; Drainage</td>
<td>0 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>Adv. Hydraulics</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Hydr. Machinery</td>
<td>0 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>Public Utilities</td>
<td>0 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>English</td>
<td>0 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>Thesis</td>
<td>1 hr.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17 hrs.</strong></td>
<td><strong>17 hrs.</strong></td>
</tr>
</tbody>
</table>

### Structural Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Design</td>
<td>5 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Sanitary Engineering</td>
<td>1 hr.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Structural Design</td>
<td>3 hrs.</td>
<td>5 hrs.</td>
</tr>
<tr>
<td>Water Power</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Adv. Design</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Roads</td>
<td>1 hr.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Public Utilities</td>
<td>2 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Heating and Ventilating</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>English</td>
<td>2 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Thesis</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17 hrs.</strong></td>
<td><strong>17 hrs.</strong></td>
</tr>
</tbody>
</table>

### FIFTH YEAR

### Sanitary Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanitary Eng.</td>
<td>7 hrs.</td>
<td>11 hrs.</td>
</tr>
<tr>
<td>Structural Design</td>
<td>5 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Heating &amp; Ventil.</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Roads</td>
<td>1 hr.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Public Utilities</td>
<td>2 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>English</td>
<td>2 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Thesis</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17 hrs.</strong></td>
<td><strong>17 hrs.</strong></td>
</tr>
</tbody>
</table>

Degree Civil Engineer.
### Transportation Engineering (Option)

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Design</td>
<td>5 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>R. R. Engineering</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Sanitary Engineering</td>
<td>1 hr.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Roads</td>
<td>1 hr.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Public Utilities</td>
<td>2 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>Railroad and Highway Transportation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electromechanics</td>
<td>3 hrs.</td>
<td>5 hrs.</td>
</tr>
<tr>
<td>English</td>
<td>0 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Thesis</td>
<td>2 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td></td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17 hrs.</strong></td>
<td><strong>17 hrs.</strong></td>
</tr>
</tbody>
</table>

Degree Civil Engineer.

### Dynamo Design

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>2 hrs. or (2) hrs.</td>
<td></td>
</tr>
<tr>
<td>Public Utilities</td>
<td>(2) hrs. or 2 hrs.</td>
<td></td>
</tr>
<tr>
<td>Thesis</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Alternating Currents</td>
<td>5 hrs.</td>
<td>5 hrs.</td>
</tr>
<tr>
<td>Dynamo Design</td>
<td>3 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Telegraphs</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Radio</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Electrochemistry</td>
<td>4 hrs.</td>
<td>0 hrs.</td>
</tr>
</tbody>
</table>

Degree Electrical Engineer.

### FIFTH YEAR

### Electric Power Plants

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>2 hrs. or (2) hrs.</td>
<td></td>
</tr>
<tr>
<td>Public Utilities</td>
<td>(2) hrs. or 2 hrs.</td>
<td></td>
</tr>
<tr>
<td>Thesis</td>
<td>0 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Illumination</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>El. Pow'r. Pl. &amp; Trans. Lines</td>
<td>2 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Electric Railways</td>
<td>2 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Telephones</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Radio</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Alternating Currents</td>
<td>5 hrs.</td>
<td>5 hrs.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17 hrs.</strong></td>
<td><strong>17 hrs.</strong></td>
</tr>
</tbody>
</table>

Degree Electrical Engineer.
Electric Communication

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>2 hrs. or (2) hrs.</td>
<td></td>
</tr>
<tr>
<td>Public Utilities</td>
<td>(2) hrs. or 2 hrs.</td>
<td></td>
</tr>
<tr>
<td>Thesis</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Alternating Currents</td>
<td>5 hrs.</td>
<td>5 hrs.</td>
</tr>
<tr>
<td>Telephones</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Telephone Design</td>
<td>0 hrs.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Radio</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Electrochemistry</td>
<td>4 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Dynamo Design</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
</tbody>
</table>

Degree Electrical Engineer. 17 hrs. 17 hrs.

Power Engineering (Mech.)

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating and Ventilating</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Public Utilities</td>
<td>2 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Power Plant Design</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Engine Design</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Mech. Laboratory</td>
<td>2 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>English</td>
<td>2 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Steam Pow'r Pl. Test</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Boiler Room Chem.</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Gas Manufacture</td>
<td>2 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Hydraulic Machinery</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Thesis</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
</tbody>
</table>

Degree Mechanical Engineer. 17 hrs. 17 hrs.

General Mechanical Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating &amp; Ventil.</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Shop Practice</td>
<td>4 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>Public Utilities</td>
<td>2 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Industrial Mgt.</td>
<td>0 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>Power Plants</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Mechanical Lab.</td>
<td>2 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>Engine Design</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Hydraulic Machinery</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>English</td>
<td>0 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>Thesis</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
</tbody>
</table>

Degree Mechanical Engineer. 17 hrs. 17 hrs.
Automotive Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Combustion Engines</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Shop Practice</td>
<td>4 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>Industrial Mgt.</td>
<td>0 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>Mechanical Laboratory</td>
<td>2 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>Engine Design</td>
<td>3 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Automotive Mechanism</td>
<td>3 hrs.</td>
<td>0 hrs.</td>
</tr>
<tr>
<td>Mechanics of Aviation</td>
<td>0 hrs.</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>English</td>
<td>0 hrs.</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Thesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>17 hrs.</strong></td>
<td><strong>17 hrs.</strong></td>
</tr>
</tbody>
</table>

157 Degree Mechanical Engineer.

After a rather lengthy discussion the faculty adopted the four years of the course as outlined but decided that the fifth year, including more or less types of professional courses should be subject to such modification as might be authorized by the faculty.

At the same time that effort was being made to introduce the five year curricula, on motion of the faculty, Dean Raymond appointed Professor Woodward, Fleming, and Ford as a committee of three to report a recommendation concerning the advisability of establishing a four year course in Management Engineering. The following recommendations dated May 31, 1922, were reported by the Committee to the faculty on November seventeenth.

1. That each senior student in the courses in civil, electrical, and mechanical engineering be given the privilege of substituting at his option in the second semester of the senior year for 3 semester hours in design either one of these two courses:
(a) A 3 hour course to be offered by the department of electrical engineering or Economics of Power Plants;
(b) A 3 hour course to be offered under the auspices of the Department of Mechanical Engineering in cooperation with other departments on Industrial and Cooperation Management.

2. The following to be the design course for which the above substitutions are permitted:

In Civil Engineering, Structural Engineering 2
In Electrical Engineering, Dynamo Design 2
In Mechanical Engineering, Engine Design 7. 161

The report was adopted by the faculty on the day submitted. The next proposal for curricular expansion came from Professor Higbee on April 24, 1925. On that date he proposed the following course in Industrial Education to be offered in the College of Applied Science for the degree Bachelor of Science and a certificate in Education.

FRESHMAN YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Military Drill</td>
<td>0</td>
</tr>
<tr>
<td>English 11(12)</td>
<td>6</td>
</tr>
<tr>
<td>Speech 1 (2)</td>
<td>2</td>
</tr>
<tr>
<td>Mathematics 21(22)</td>
<td>23</td>
</tr>
<tr>
<td>Engineering Drawing 3</td>
<td>5</td>
</tr>
<tr>
<td>Chemistry 1(2) or 3(12)</td>
<td>8</td>
</tr>
<tr>
<td>Shop work</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td>34</td>
</tr>
</tbody>
</table>

SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Military Drill</td>
<td>0</td>
</tr>
<tr>
<td>Physics 7(8)</td>
<td>11</td>
</tr>
<tr>
<td>Descriptive Drawing</td>
<td>2</td>
</tr>
<tr>
<td>English 7(8)</td>
<td>4</td>
</tr>
<tr>
<td>Elementary Psychology</td>
<td>3(4)</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td>6 Note a</td>
</tr>
</tbody>
</table>
SOPHOMORE YEAR (Cont'd)

Shop work (Forge and Machine Shop)  4 Note b
Woodworking courses       6 Note b, Note c

33

JUNIOR YEAR

Physical Training        0
Education 1 (2)            6 Note a
Machine Drawing          3
Electrical Construction  6 Note b
Political Science         4 Note a
Architectural Drawing   3 Note b Note c
Free Electives            12

34

SENIOR YEAR

Physical Training        0
Education 3(4)            6 Note a
Industrial Education
(Organization Methods)  6 Note b
Observational Work in teaching (Shop and Drawing) 4 Note b
Special Shop courses  10 note b, note c
Free electives            8

34 165

Following the report containing the outline of the Industrial Education course the faculty voted that the course be adopted subject to the approval of the President and State Board of Education. The nature of the course was such that had it been inaugurated a real deviation in policy would have been effected and for this reason it was apparently never recommended to the Board
Perhaps as Professor R. J. Lambert stated it was left on the President’s table.

The final effort of Dean Raymond to formulate a new course was made during the late winter and spring before his death. It was his desire to formulate a course which would be known as "Public Utility Engineering and Economics." Describing its nature, the Dean wrote that it was designed to prepare graduates to take positions in the commercial departments of public utility enterprises, looking eventually toward administrative positions rather than toward engineering positions. This course would have little more than a third of what might be called engineering subjects; about a third of what might be called general subjects, including mathematics, English, physics, chemistry, etc., and about a quarter of subjects in economics, including general political economy, accounting, corporation economics and finance, labor economics, money and banking, law of contracts, public utility relations, etc. 169

The proposed course in Public Utility and Economics was considered by most of the faculty to be desirable and was outlined as follows:

FIRST YEAR

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech</td>
<td>1 hr.</td>
</tr>
<tr>
<td>English</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Mathematics</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>Drawing</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>Shopwork</td>
<td>2 hrs.</td>
</tr>
<tr>
<td>Chemistry</td>
<td>4 hrs.</td>
</tr>
</tbody>
</table>
Considering the welfare of the business itself and the possible advancement of the graduate who enters industry, Dean Raymond sought to determine the merits of the course by securing an expressed opinion from leaders in business by addressing to them the question, "Is such a course as I have mentioned, which would be a combination of engineering fundamentals and fundamentals of economics, a better preparation for the public utility industry than a thorough engineering course, particularly perhaps mechanical or electrical engineering?" The responses
to his query were almost unanimously in favor of introducing the course proposed and outlined, but unfortunately, his unexpected and untimely death which occurred on June 17, 1926, prevented him from completing the task he endeavored to do so well.

The academic growth, expansion, and curricular enrichment effected in the College of Applied Science were accompanied by a real development and improvement of the physical properties which consisted of buildings and equipment. Buildings to house Engineering at the time the College of Applied Science was established were neither adequate nor impressive and the equipment was not equal to that of the more famous American schools of engineering. Both, however, were rapidly increased. The first section of the Hall of Engineering, for which plans had been drawn while engineering was yet a school of Applied Science, was not only completed and occupied during the first year of the College's existence but it was announced in March, 1906, that "new buildings covering 64,000 square feet of ground area, with better facilities for individual instruction than are provided by any engineering buildings yet erected are planned and will be built as rapidly as the increase in attendance demands." The portion of the new building occupied, in January 1906, contained six rooms for study, drawing and recitation; one room for recitation or lecture only; one room intended for similar use, but used temporari-
ly for the library and desk and recitation room for the senior class; a janitor's room; an executive office and faculty room; eight instructors' offices and a basement fan room. One of the chief features of the building was the furnishing which gave each student a study desk and a drawing table in a room in which, so far as possible, all his work was done.

Almost simultaneously with the building of the New Engineering Hall was the construction of an extensive hydro-electric power plant in the Iowa River. Consisting of a concrete dam which gave eight feet head of water, a canal for flow experiments and a power house for development of power, the plant was completed under the supervision of Professor B. J. Lambert in October 1906, and gave an added feature both unique and valuable to the engineering school.

Very soon after its establishment the College of Applied Science was described as being housed in the "Hall of Engineering" and the "Engineering Laboratories," which at that time included, "a hydraulic laboratory, a laboratory for testing materials of construction, an electrical laboratory, and a steam laboratory." In addition to these the light, heat and power plant of the University was available for experimental purposes in the courses in steam and electrical engineering, the heating and ventilating systems for the course in heating and ventilating, and the hydro-
electric power plant for work in testing hydraulic and electric machinery.

The hydraulic laboratory which was eventually to be located in the southwest corner of the new engineering building was located in the north end of the basement of the Old South Hall. Equipment in this laboratory according to the *College Announcement* published in 1907, consisted of a Worthington duplex fire pump of five hundred gallons per minute capacity, tanks, standard orifices, Weirs, hook-gage, water-meters of various forms, and a Price acoustic current meter.

The laboratory for testing the physical properties of materials was located in the basement of the old Medical Building until 1909, when it was moved to the basement of the Hall of Engineering. Equipped with an autographic torsion machine, a Riehle automatic standard testing machine of 100,000 pounds capacity, a standard abrasion cylinder for testing paving materials, a Fairbanks automatic briquette machine of 2,000 pounds capacity, and a full line of tools for preparing wood, metal, cement, or concrete specimens it was one of the best in the middle West.

Housed in the electrical building until 1913 when it was transferred to the new physics building, the electrical laboratory, was supplied with both direct and alternating currents from the University light and
power plant and the new hydro electric plant. Included in the equipment were examples of the various classes of electrical machines in common use, with the necessary complement of instruments for testing. Each year following the establishment of the College of Applied Science much new equipment was added to this laboratory and in 1907, it was required to make possible new machine and power connections.

With the establishment of the Chair of Steam Engineering the need for a steam laboratory became imperative and consequently it was the first of the new laboratories to be built in the engineering quadrangle. Located just east of the University's heating plant, this laboratory, a one story brick building of monitor type was authorized in 1906, and made ready for occupancy the following year. Although all the apparatus desired was not secured at once, equipment consisting of steam engines, gas engines, a refrigerating plant, and an apparatus for testing steam appliances was procured and made it not only of the most complete steam laboratories in the country but one that proved to be "a very useful adjunct to the department of mechanical engineering."

The facilities for engineering education available during the first year after the College of Applied Science was established were quickly recognized to be inadequate if the rapid progress experienced since the
establishment of the School of Applied Science was to continue. The Board of Regents, therefore, in their first report following the establishment of the College of Applied Science, after expressing the "absolute necessity" for an extension of the engineering building stated:

Another item of building which we do not enumerate in the list of buildings to be provided for by the future millage tax, is the engineering shops and power house in connection with the dam. Our reason for omitting these important items was their immediate importance and that it was unwise to defer their erection until they could be cared for by the tax. As has already been stated in this report, the special appropriation for the erection of an engineering building which was supplemented by a small amount of millage tax, was used in the erection of a part of the main building, but shoproom was not provided for and shops to be used in connection with that work are one of the necessities which demands immediate attention. Second only to the immediate enlargement of the hospital, comes the completion of what goes with the dam, provided for by the last general assembly this season. The investment in the dam is useless commercially and for educational purposes unless supplemented by an appropriation for the power house and equipment of it and the connection for the transmission of power, all of which was asked for from the last general assembly but not provided for. The construction of the power house and its equipment, to be used in connection with the dam and engineering shops will cost $35,000, for which an appropriation is asked.

The Thirty-first General Assembly although not making an appropriation equal to the amount requested did appropriate thirty thousand dollars for "engineering shops, hydraulic power house, power connections with the dam and equipment." With this appropriation needed facilities
for engineering education in part, were supplied during the years immediately following. With the completion of the shops, the Board of Regents reported the following improvements and the resulting advantages which were realized during the first five years after the College of Applied Science was established. By the completion of the extension to the Hall of Engineering it was made possible to vacate one of the engineering "sheds"; the new steam laboratory greatly improved facilities for mechanical engineering and the hydraulic power house, in addition to providing special facilities for engineering furnished light and power for the University, which if purchased at commercial rates in Iowa City would cost over fifteen thousand dollars a year. Completed and ready for occupancy, in 1910, the engineering shops housed equipment described as "modern excellent and ample" which would be increased as occasion demands. Perhaps, the best evaluation and "statement of equipment" in the College of Applied Science as it existed three years later may be found in a letter written by Dean Raymond to James B. Weaver of Des Moines. Under date of February 23, 1913, the Dean wrote:

For the number of students we have, our equipment is excellent and lacks but two items of being sufficiently complete for teaching purposes. We have no foundry and are obliged to get our castings done elsewhere. We have no photometric laboratory in connection with our electrical engineering department. With these two exceptions our laboratory equipment in each
of the different lines is adequate to our needs and in the several kinds of apparatus is of the highest grade.

1. We have a forge shop which has been pronounced by competent critics one of the best in equipment and arrangement for a small shop in the country.

2. We have an excellent wood working shop in which our students learn carpentering, joinery, but more particularly pattern making and in which they make patterns for centrifugal pumps, gas engines, steam engines, boring mills, lathes, etc. These patterns go to nearby foundries where the castings are made, are returned to our shops and machines.

3. We have an excellent machine shop in which the castings mentioned above are prepared for assembling and are put together ready for use. Our shops are partly equipped with machinery built by our students.

4. We have an excellent steam laboratory, better than anything of its kind in the state and the equal of most steam laboratories west of the Mississippi. It contains various types of steam engines, gas engines, hydraulic motors, air compressors, superheaters, condenser, and complete refrigerating plant. All of this machinery is actually operated for experience and experimental purposes only by our students.

5. We have an excellent electrical engineering laboratory, - I think one of the best arranged in the country - and while our collection of machinery is not entirely complete, it is ample for teaching the subject to our present relatively small classes!

6. Our hydro-electric plant is one of only two such plants operated under commercial conditions possessed by colleges or universities in this country, and no other institution outside of Cornell University is so well equipped to study the action of hydraulic machinery as we.

7. We have a small but excellent testing laboratory, ample for all the work that has ever come to us,
and in which we do a larger share of the commercial testing of the state in addition to our work of instruction. The laboratory is for the purpose of testing the strength of materials such as brick, concrete, stone, wood, building tile, iron and steel, and cement.

8. We have an excellent collection of Engineers' field instruments, more even than we need for our present attendance, the equipment having been purchased a few years ago when our attendance was larger. The instruments are all of modern make from the best makers.

9. We have a good blue print room with both sun and electric printing machines.

10. We have the best, most complete equipment for individual class room instruction in any institution of college grade, either engineering or other, in this country, and as far as is practicable our work is carried on much the same as would be the work in an engineering office, every man having his own desk and drawing table where he works throughout the day, except when in the laboratories, under the direction of an instructor and where he is privileged to work, and many do work, from 7:00 in the morning until midnight.

11. Our buildings are the engineering building proper, in which the instructors' offices, class rooms, blue print room, surveying equipment, and testing laboratory are located; the steam engineering laboratory; and the shop buildings. Our electrical laboratory is located in the magnificent new Physical Building, and our hydro-electric plant in the river at the lower end of the University property.

12. We have an excellent modern technical library, and we receive all of the better technical journals which are placed on tables in the Students' Room in the engineering building. This room is a feature of our building and is a reading room, meeting room, and sort of general club room for the student body.

I think the foregoing enumerates practically all of our equipment that is worth enumerating. Of course, we have in connection with our College of Applied Science the use of the University departments of physics, geology, chemistry, biology, etc.
The "statement of equipment" was made by Dean Raymond to be used as supporting evidence by those opposing the disestablishment of engineering at the University. Following the discussions which accompanied the controversy of 1912-1913, the College of Applied Science "altogether uninterrupted" continued to expand and experience further material development. The foundry for which Dean Raymond expressed a need, was very soon provided as work on an "addition to the engineering shops for foundry purposes" was authorized following the special appropriation of twenty five thousand dollars for engineering.

The progress evidenced in buildings and equipment for the biennium preceding 1916 was described by Dean Raymond in his report to the President. Herein the Dean wrote:

During the biennium the electrical laboratory, the senior recitation room, lecture room and faculty offices have been removed from the old brick building back of the Old Capitol to the new Physics Building. New equipment to the value of approximately $6,000 has been added to the laboratory.

The year just passed saw the beginning of instruction in molding in the Department of Mechanical Engineering, equipment being purchased for this work with funds furnished by the special appropriation of the last General Assembly. A foundry has been asked for and ordered by the Board of Education, and construction on it has begun. It is expected that it will be occupied the coming fall, when we shall for the first time be able to offer instruction in the four principal lines of shop practice, namely: smith work, wood work, machine work, and foundry work.

The material progress reported at this time was continued during the remaining bienniums of Dean Raymond's
administration. Manifested by not only an almost continuous building program in which he was at all times interested and which resulted in the expenditure of several hundred thousand dollars for the construction of an addition to engineering hall, the hydraulic testing plant, additional engineering shops, a new steam laboratory, and the completion of the hydraulic laboratory together with the installation of beginning equipment; progress was manifested also, by the development of radio beginnings and the establishment of the University Radio Station.

As early as 1911, radio experimenters were at work in the university laboratories and during that year Robert Earle and R. C. Giese using a "straight spark gap" constructed a "two kilowatt transmitter" in the basement of the Physics Building. Because of the crude equipment available efficient transmission was practically impossible but the installation of a station such as this created considerable interest and initiated the University as a pioneer in the field of radio. The great interest evidenced in radio and the recognition of its possibilities prompted those in charge to make application to the department of commerce for an operating license. The license was granted and the call letters 9YA were assigned. Its main function was that of an experimental station and the intrepid engineers spent
much time endeavoring to improve it, and in working neighboring stations. Improved apparatus was secured and new equipment installed making greater distance reception possible but the experimental work was halted temporarily in 1917, by an executive order which suspended the license of all amateur radio stations for the duration of the war between the United States and Germany. With the lifting of the ban on February 13, 1920, interest in radio was quickly revived and experimental work resumed. Conducted by Carl Menzer and Pete Stover the attention of President Jessup, and Dean Raymond and Professor Ford was attracted. Alert to the progress of science and realizing the feasibility of developing work in the field of radio an application for a broadcasting license was made and on June 26, 1922, it was granted. The call letters WHAA were received and the station was authorized to operate on a frequency of 834 kilocycles with a power of one thousand watts. However, on November 8, of the same year, the power was reduced to two hundred watts, because of the transmitter's inability to carry such great power.

The station was located in the Physics Building and classrooms served for studios during the dedicatory ceremony of the first official broadcasting station at the University of Iowa held on October 17, 1922. A talk by President Jessup and Dean Raymond commemorated
the occasion which was not only a memorable day for the College of Engineering, under whose auspices radio had been established but for the whole University of Iowa because almost at once it began to assume great proportions in the university structure and transcend the college in which it had been nurtured.

The rapid development of the radio industry during the months which followed the Dedication of station WHAA and the establishment of numerous commercial stations made the procurement of new equipment imperative and studio accommodations highly desirable. The studio was highly desirable. The studio was moved to the top floor of the Engineering Building and an allotment was made for new equipment and the supervision of installation and remodeling of rooms to provide the proper facilities and acoustics it became apparent that student and graduate assistants operating the station were inexperienced and should be replaced by a full time, well qualified technical director. For this position Dean Raymond, Manager of the station, recommended Carl Menzer and on September 10, 1923, Mr. Menzer assumed his duties which included all radio activities. Summarizing his own desire and the duty of the newly appointed technical director Dean Raymond said: "I desire an expanded and improved program service and the best broadcasting equipment available". He foresaw the future of radio science and the great
service it would perform in educational broadcasting
and he was determined to keep the College and University
a leader in the pursuits of education. Under the manage-
ment of Dean Raymond, therefore, and directorship of
Mr. Menzer the march of progress began. New equipment
was added, studios were made almost acoustically perfect
by padding and draping the walls, and a license for in-
creased power and favorable operating frequency was re-
quested. To support the antenna system on top of the
Engineering Building was supported by two one hundred and
twenty foot steel towers designed by Professor Lambert.
The request for better frequency and more power was
granted on February 13, 1924, in the name of the College
of Applied Science. Granted a frequency of 620 kilo-
cycles and a power of five hundred watts at this time
the frequency was shifted annually or semiannually during
the following years because of experiments being con-
ducted by the Federal Radio Corporation. On December 3,
1929, however the frequency of 880 kilocycles was granted
and on February 12, 1935, the power of one thousand watts
and unlimited time was granted . Call letters, too,
were changed during the time Dean Raymond managed the
station. At the time that call letters, WHAA, were
assigned Dean Raymond requested that the call, WSUI, be
allotted. The request, however, was denied because at
the time, they were being used by a sea going vessel.
The request was left on file and on January 19, 1925, following the withdrawal of the vessel the call letters, WSUI, were granted permanently to the University of Iowa.

The following year after the death of Dean Raymond the station was placed under the control of a board appointed by President Jessup. Following this action it ceased to be so intimately a part of the College of Engineering and became associated in a measure with all colleges and departments, a medium by which the life of the total University was diffused.

The enlargement of the engineering hall, and the laboratory facilities and the procurement of more equipment had been made necessary by the increased attendance in the College of Applied Science following its establishment, in 1905. Reporting to the Thirty-third General Assembly, in 1908, the Board of Regents stated that, "the number of students in engineering has nearly doubled in two years and trebled in the last three. They will probably, within the year, occupy all the added space, and already need large increase of shop room."

Reporting on attendance in the College of Applied Science, prior to 1914, stated that:

During the four or five years following the financial depression of 1907 attendance in engineering schools fell off materially throughout the United States. Statistics of many years
show that such decreased attendance is to be expected after every financial crisis and that the low water mark in attendance is reached in from four to five years after the beginning of the financial depression. Our College of Applied Science was among the first to begin to recover, the entering class of the fall of 1912 being about 50% larger than that of the preceding, the entering class of the fall of 1913 being about 35% larger than that of the fall of 1912, while the total attendance for the year just passed has amounted to 208 an increase of 29% over that of the previous year. With the passing of the small upper classes and a reasonably large incoming freshman class the fall of 1914 should see the largest attendance that the College has yet had. 231

The increase and decline in attendance in the College of Applied Science as described by Dean Raymond is shown most clearly in the following table.

<table>
<thead>
<tr>
<th>School Year</th>
<th>Students enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>1904-05</td>
<td>95</td>
</tr>
<tr>
<td>1905-06</td>
<td>162</td>
</tr>
<tr>
<td>1906-07</td>
<td>230</td>
</tr>
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<td>1907-08</td>
<td>231</td>
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<td>1908-09</td>
<td>203</td>
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<tr>
<td>1909-10</td>
<td>168</td>
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<tr>
<td>1910-11</td>
<td>161</td>
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<tr>
<td>1911-12</td>
<td>144</td>
</tr>
<tr>
<td>1912-13</td>
<td>162</td>
</tr>
<tr>
<td>1913-14</td>
<td>208</td>
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<tr>
<td>1914-15</td>
<td>228</td>
</tr>
<tr>
<td>1915-16</td>
<td>251</td>
</tr>
<tr>
<td>1916-17</td>
<td>221</td>
</tr>
<tr>
<td>1917-18</td>
<td>175</td>
</tr>
<tr>
<td>1918-19</td>
<td>227</td>
</tr>
<tr>
<td>1919-20</td>
<td>415</td>
</tr>
<tr>
<td>1920-21</td>
<td>411</td>
</tr>
<tr>
<td>1921-22</td>
<td>393</td>
</tr>
<tr>
<td>1922-23</td>
<td>389</td>
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<tr>
<td>1923-24</td>
<td>389</td>
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<td>1924-25</td>
<td>352</td>
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<tr>
<td>1925-26</td>
<td>235</td>
</tr>
<tr>
<td>1926-27</td>
<td>255 232</td>
</tr>
</tbody>
</table>
Explanation for the increased attendance during the years following the establishment of the College of Applied Science and again after the recovery from the depression of 1907, until the decade of the twenties, aside from economic reasons may be found in the rank achieved by the college and the publicity it received. In addition to the publicity received during the attempts to disestablish engineering at the University in 1904, and again in 1912, the College of Applied Science for the first time was allotted funds for advertising in scientific journals. In June 1904, an allotment of $99.50 was made by the Executive Committee for advertisements in the following journals:

- Western Electric, 13 issues at $1.75 \( \text{total} \) $22.75
- Engineering Record, 13 issues at $.60 \( \text{total} \) $7.80
- Engineering News, 52 issues at $.60 \( \text{total} \) $31.20
- The Bulletin of the Iowa Engineering Society (inside back page), \( \text{total} \) $12.00
- Scientific American, 3 issues $5.25 \( \text{total} \) $15.75

In addition to the paid advertising which was continued after 1904, publicity of a more effective nature than ever before was given not only to the College of Engineering but to the entire University. The need for interesting, alive and attractive advertising was realized by President Bowman, himself a trained newspaper man, and he directed that "mummified information" bulletins should be transformed into bulletins attractive to the eye,
with photographs of university buildings, campus and class room scenes, and views in the country adjoining Iowa City, and on the Iowa river. It was the aim of the President that a pictorial view of the University and its colleges should be put in circulation and distributed in every section of the state in order to further acquaint people with the fact that Iowa had a great University. This up to date publicity campaign, inaugurated by President Bowman, was made more effective by the fact that courses had been so arranged under the direction of Dean Raymond that engineering students were able to procure not only the training of a technical school but a University education in a college that "continued to improve" and whose graduates made "most creditable records." From the beginning Dean Raymond had sought to introduce a method of instruction that would free the College of Applied Science from criticism directed at College methods and charging that they "are not being devised to keep pace with the changing conditions of civilization." Under his direction a plan of instruction unique in colleges of engineering and applied sciences, if not all colleges was inaugurated. The essential features of the plan were:

1. Long periods of work under instructors' direction instead of short class room exercises.

2. The advancement of the individual student to new topics of a subject only as he
satisfactorily accomplishes the earlier topics.

3. The provision of study space, desk and drawing table for each student and a separation of the space thus allotted into small portions in separate rooms accommodating not more than twenty students.

4. The division of classes into small sections to insure personal attention by the instructor to the individual. The lecture system is entirely abandoned in the technical subjects.

Essentially it was a plan to give individual instead of class instruction to the students in engineering courses; and while it was acknowledged to be an experiment, it was taken up with every confidence that it would succeed and become the system of instruction in the College of Applied Science. The success of the "experiment" may be judged from the report of Dean Raymond expressed in the following manner in 1912:

In my judgment the result amply justifies the expenditure. It is doubtful if any young men leave any college in the country more thoroughly prepared than those graduated annually from this college. In evidence of this is the constant demand for graduates "like those we had before. You seem to know what we want." The graduates are making creditable records.

Probably in no other school in the country was there as close contact between instructor and student or so many hours spent by the student under the immediate direction of the instructor as in the College of Applied Science since the inauguration of the new plan. The only similar plan of higher educational work was the
recently established tutorial system at Princeton, but the two systems were far from identical. The giving of each student the help and direction he needed without giving that unneeded or wasting his time while help and direction, unnecessary to him, were given to others was perhaps the greatest advantage of Dean Raymond's plan. Other advantages were to be found in the fact that instructors became better acquainted with the students' ability and his grasp of the subject considered in the course; thus making possible the more rapid advancement of students of superior ability and the further assistance of the slower ones in such a way as to save them from failure. Although thoroughly convinced that the method adopted was "the rational method of instruction in Engineering" the impossibility of supplying the necessary instructors in the college and because of its dependence upon the work of the College of Liberal Arts the plan was abandoned, in 1920, at the same time being almost universally acknowledged as superior to the commonly accepted method.

The advancement of engineering academically, materially and in methods of instruction during the score of years plus two which followed the establishment of the College of Applied Science had been under the direction of Dean Raymond and although his work was
ended by his death on June 17, 1926, his splendid ideas remained an active force in shaping the course and traditions during the years that followed in the College of Engineering, the title to which the College of Applied Science was changed by action of the Board of Education as they adopted the recommendation of the faculty presented to them by President Walter A. Jessup on May 27, 1927.
Chapter VII
THE COLLEGE OF ENGINEERING 1927-1944

As Dean Raymond spent almost a year at the University of Iowa before the school he directed became known as the College of Applied Science, so also did his successor, Dean C. C. Williams spend almost the same length of time, before the title of the College over which he presided became known as the College of Engineering.

Elected to the Deanship of the College of Applied Science by the Board of Education, on July 13, 1926, Dean Williams assumed his duties officially at the University of Iowa on September first of that year. Following his graduation from the University of Illinois in 1907, with a Bachelor of Science degree in Civil Engineering, Dean Williams accepted an instructorship at the University of Colorado and two years later he received the professional degree in Civil Engineering from that institution. He continued his work in Colorado as Assistant Professor and Acting Professor until 1914, when he accepted the position of Professor of Railway Engineering at the University of Kansas where, after four years, he was named Professor of Engineering. In 1922, he became Head of the Department of Civil Engineering at the University of Illinois and from that position he was called, following the death of Dean Raymond, to be Dean of the College of Applied Science in
the University of Iowa.

At once, instructor and author, the new Dean was not lacking in the experience gained from private practice. Acquired in railway and public utility work as well as in structural, municipal, and hydraulic engineering, his greatest practical experience was gained, perhaps, as supervising engineer for the War Department, in charge of construction on a $65,000,000 explosives plant at Nitro-West Virginia.

A leader in his profession, Dean Williams very soon after assuming his duties in the College of Applied Science declared that he would endeavor to maintain the present high standards for which Dean Raymond strove with such steadfast devotion and as opportunity offers, to attain more fully the position of leadership which the college of engineering at a great state university which is so prominent in many lines may be expected to hold.

Confronted upon his arrival at the College of Applied Science with a movement to obtain an accurate title for the college in which the departments of engineering were administered, he supported the resolution adopted by the faculty on October 15, 1926, recommending to the "Board of Education that the name College of Engineering be substituted for the name College of Applied Science." Presented to the Board by President Jessup the recommendation was unanimously adopted on May 27, 1927.

In addition to favoring a more appropriate title
for the college of which he was head, Dean Williams sought promptly to have it "attain more fully the position of leadership" by a further enrichment of the engineering curricula and an improvement of the facilities for instruction. Appointing a committee on courses and curriculum at the faculty meeting on October 15, 1926, he directed that it "make a careful analysis of the courses and curriculum of the college with reference to possible improvement in certain respects." The committees, with Professor Woodward as its chairman, proceeded at once to perform the task for which it was created and on December 17, the chairman reported that

the committee had tentatively agreed on a freshman year uniform for the first semester for all engineers and for both semesters for civils, mechanicals, and electricals. The committee expected to recommend courses that would include considerable differentiation in the senior year and more moderate differentiation in the sophomore and junior years, and to have completed its work in time so that the courses finally adopted could be printed in the new catalogue.

On January 21, 1927, Professor Woodward, in the name of the committee on courses and curriculum presented a "summary of proposed new engineering courses" which after "considerable discussion" was approved by the faculty with the recommendation that "two semester hours of English be retained in the senior year of the civil electrical courses as well as the mechanical courses."
The curricula adopted in 1927, was announced in the
University Catalogue and provided for no differentiation of courses in the freshman year except for those enrolled in the department of chemical engineering. The courses offered in each department according to the announcement in 1927, were as follows:

**FRESHMAN YEAR**

<table>
<thead>
<tr>
<th>Credit Hours</th>
<th>1st. Sem.</th>
<th>2d. Sem.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Military drill thrice weekly</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>English 11 (12)</td>
<td>3</td>
<td>3</td>
<td>6</td>
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<tr>
<td>Speech 1 (2)</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Mathematics 5(6)</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Engineering development</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Surveying 2</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 1(2) or 3(12)</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
<td><strong>17</strong></td>
<td><strong>34</strong></td>
</tr>
</tbody>
</table>

**CIVIL ENGINEERING**

**Sophomore Year**

<table>
<thead>
<tr>
<th>Credit Hours</th>
<th>1st. Sem.</th>
<th>2d. Sem.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Military drill thrice weekly</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mathematics 23(24)</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Physics 7 (8)</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Surveying 21</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Engineering problems 2</td>
<td>0</td>
<td>2</td>
<td>2</td>
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**JUNIOR YEAR**

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## ELECTRICAL ENGINEERING

### SOPHOMORE YEAR

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### SENIOR YEAR

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Technical electives: Electric railways 3; Thesis 8; Electric heatings 2; Telephony 3; other engineering courses on approval.
### MECHANICAL ENGINEERING

#### SOPHOMORE YEAR

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#### JUNIOR YEAR

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### CHEMICAL ENGINEERING

#### FRESHMAN YEAR

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#### SOPHOMORE YEAR

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* French or German
### JUNIOR YEAR

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<tr>
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### SENIOR YEAR

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<td>Principles of chemical engineering 147(148)</td>
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**Total**: 17 18 35

### GRADUATE YEAR

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<td>Heat engines 71</td>
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<td>5</td>
<td>10</td>
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</tbody>
</table>

**Total**: 15 15 30
Note 1. The special courses listed in any one of the above groups cannot be offered unless in any one year the group is elected by at least four students.

Note 2. The election of a thesis instead of one of the group options will be permitted only in the case of students who have shown marked or exceptional ability. The subject of the thesis must be approved by the technical faculty.

Note 3. Non-Technical Elective: Any available subject offered in the University and approved by the faculty advisor.

Note 4. Military science may be substituted for physical training in the junior and senior years.

GENERAL ENGINEERING

FRESHMAN AND SOPHOMORE YEARS

The work of the freshman and sophomore years is the same as that of the mechanical engineering course.

JUNIOR AND SENIOR YEARS

In the Junior and Senior years, the general engineering course varies from the mechanical engineering course by substituting foreign language (German, French or Spanish) for technical electives, mechanical laboratory and mechanical design to the extent of 14 credit hours. 12

Although the curricula in engineering covered the primary fields of the profession: "Civil Engineering with its divisions of Structural, Hydraulic, Sanitary and Transportation engineering; Mechanical Engineering with branches, Power, Automotive and Manufactures engineering; Electrical Engineering with several options and Chemical Engineering with several options and Chemical Engineering,"
the committee on courses and curriculum reported to the faculty on March 4, 1927, and recommended the establishment of a four year course in "Commercial Engineering which should lead to the degree Bachelor of Science." On the same day the Committee on Educational Policies presented a recommendation that the degree Bachelor of Engineering be replaced by the degree Bachelor of Science with the particular course designated, for example, Bachelor of Science in Civil Engineering be substituted and beginning with the school year 1927-1928, requirements for the professional degree in engineering be made to include a thesis. The recommendations of the two committees were presented to the Board of Education by President Jessup and approved on April 12, 1927.

The new Commercial Engineering course in the Commerce and Engineering Colleges, was designed to combine a basic technical training with a sufficient knowledge of accounting and economics to prepare a student to enter advantageously into the distinctly business phases of engineering, such as sales and application of mechanical and electrical equipment; the operation of public utility plants; the administrative direction of commercial shops and factories; and the appraisal work of investment and bonding concerns. The course was a modification of the regular curriculum in mechanical or electrical engineering with commerce courses, such as principles of economics,
accounting, marketing, corporation finance, business
statistics and public utilities, being substituted to
the extent of twenty one credit hours for design and
elective courses.

Determined to achieve a top ranking position
among engineering colleges and attain more fully a qual­i-
tative leadership in engineering education, the curricula
was kept under almost constant surveillance and study.
To meet the increased demands of the profession new courses
in Industrial Engineering and Aeronautic Engineering were
introduced at the beginning of the second semester in
January 1920. Chief among the subjects offered in the
new courses were, "Personnel Administration," which in-
cluded a study of topics dealing with employment methods,
labor turnover, base rate determination, employers' associa-
tions and industrial relations; a course in "Plant Design
and Equipment," provided instruction in the functional de-
sign of industrial plants, while time and motion, produc-
tion and quality control, cost finding, and job-analysis
constituted subject matter for a third course called
"Production Control". The Courses in Aeronautic engi-
neering, offered for the first time in 1929, provided
instruction in the theory of Aeronautics, as well as the
materials used and the details of structural elements of
Aircraft. Thoroughness in Aeronautical courses was
greatly enhanced by the United States War Department's
donations of materials for student use. Included in the consignment received, and amounting to over fifteen thousand dollars, was a Packard airplane motor, a Liberty motor, aviation thermometers, tachometers, induction compasses and miscellaneous flight equipment.

The enrichment of the mechanical curricula by Industrial and Aeronautic Engineering as technical options in that Department was paralleled in the Department of Electrical Engineering. In this department the development achieved under Professor Ford neither languished nor receded under Edwin B. Kurtz. Elected Professor and Head of Electrical Engineering in 1929, Professor Kurtz, almost at once, began to stress the need for specialization during the junior and senior years. To meet his standards the electrical curriculum was adjusted and made to carry options in Power and Communications thus making it similar to the curricula in other recognized institutions. In order to avoid over specialization students were encouraged to select several courses from each option. The two options and the courses offered in each as announced in the University Catalogue follows:

**Power Option**

- Electrical Power Transmission, E. E. 173
- Illumination and Photometry, E. E. 45
- Hydrology, M. & H. 111
- Central Stations, E. E. 174
- Water Power Engineering, M. & H. 112
Communications Option

Telephone Communication, E. E. 76
Elementary Transient Phenomena, E. E. 102
Radio Communication E. E. 75
Advanced Telephone Communication E. E. 106

The curricular changes and enrichment in Electrical Engineering was accompanied by an increase in equipment of such magnitude that by 1930, more space to house the department became practically imperative. On January 51, 1930, therefore, it was recommended by the Building and Business committee of the Board of Education:

1. That the equipment for the Department of Electrical Engineering be moved from the Physics Building to the Old Chemistry Building.

2. That the ground floor on which the equipment will be placed be properly constructed.

3. That an allocation amounting to not more than $15,000.00 be made to pay the cost of moving the equipment, of the construction of a concrete floor, and of certain adjustments.

On motion, the recommendations of the committee were approved by the Board of Education and very soon plans for the relocation of Electrical Engineering were under way. In order that the new quarters might be made comparable if not superior to those housing electrical departments in other institutions "certain necessary equipment and replacements for the Department of Electrical Engineering in the Old Chemistry Building were made" and Professor Kurtz was authorized to inspect the electrical engineering
laboratories at Purdue University and the University of Minnesota.

Remodeled and redecorated the first two floors of the building were made ready for the electrical department during the summer of 1930. Located on the first floor were the radio and telephone laboratory, high voltage laboratory, illumination laboratory, circuit and machinery laboratory and the shop and meter room. Of particular significance was the 250,000 volt transformer located in the high voltage laboratory and capable of uniform voltage variation from zero to maximum. Power to the high voltage laboratory was furnished direct from the university sub-station by a special 2300 line voltage. The opportunity to work with such high potential power and to study its behavior and related dielectric phenomena gave an advantage to the students of electrical engineering that was almost singular since the newly equipped high potential laboratory was one of the few in the United States.

The standardization laboratory, the illumination laboratory, and the circuits and machinery laboratory were all thoroughly outfitted and built with high ceilings and many windows in order to provide ample light and ventilation. Installed in the circuits and machinery laboratory was a "sine wave generator set, a high current transformer and a cathode ray oscillograph." In addition
to the regular equipment of telephone, telegraph and radio in the communications laboratory television equipment was installed - thus making the department one of the first in the United States to provide facilities for study and research in television.

Television was first demonstrated in Iowa City by W. N. Parker, engineer in charge of transmitter designs at the Western Television Corporation of Chicago, before the Iowa City Engineer's Club, in April 1931. Following the demonstration an application was made to the Federal Radio commission by Carl Menzer, director-announcer of the University Radio Station, for a television broadcasting construction permit. It was planned to build a ten foot stage and equip it for broadcasting both close up and full length images and to have the station synchronized with the University Radio Station, WSUI, so that receivers might see and hear programs from Iowa City.

On January 26, 1932, it was reported to the Board of Education that the Federal Radio Commission after considering the application of the State University of Iowa found that "public interest, convenience and necessity" would be served by granting the application as follows:

Construction permit, 2000-2100 kc, 100 watts power: Hours of operation: Unrestricted with provision that the use of the frequency is granted on a time sharing basis with the understanding that mutual
agreements will be made with other licenses
wherever there may be possibilities of inter-
ferences.

It is ordered, effective this date,
that said construction permit be issued in ac-
cordance with said finding. 42

To secure the necessary information in regard
to the equipment and its arrangement in the station, Pro-
fessor Kurtz and instructor Mr. J. L. Potter, were
authorized to confer with engineers and officials of
Western Television Corporation. A conference with the
manager of the Chicago radio station WMAQ, was authorized
at the same time in order to discuss the general plans for
the television station to be located in the engineering labo-

ratory. The equipment and apparatus offered almost un-
equalled facilities for instruction and practical opera-
tion. Following its installation a course in television
was offered to all "senior electricals" desiring the course. 44

In addition to providing more equipment and an
opportunity for study in new fields of science the De-
partment enjoyed a real distinction among electrical engineer-
ing departments, by providing individual desks for juniors
and seniors. Although the arrangement made no particular
change in the method of teaching it did supply a better
place and environment for study and student materials
and gave easy access to the reference library of the late
Professor A. H. Ford, donated to the department and now
available to students of electrical engineering.
With the Electrical Engineering Department located and adequately housed on the first and second floors in the Electrical Engineering Building, formerly known as the Old Chemistry Building, the third floor was remodeled and decorated for Engineering Drawing.

Under the direction of Professor Frederic G. Higbee since 1905, the department of Drawing had expanded greatly and to provide more room it was transferred from the Engineering Building, to the third floor of the Electrical Engineering Building in 1931. In the new location offices for Professor Higbee and his assistants together with newly furnished drawing rooms were provided. Each of the three drawing rooms was provided with twenty-five desks of wooden construction and built to accommodate four students. Walls in the rooms were finished in light buff to eliminate the glare and artificial light from sixteen overhead lights made them well lighted drawing rooms. The special allotment of $4,567.75, on May 23, 1931, by the Board of Education for equipment in the Drawing Department made it possible to furnish the new rooms in an up-to-date fashion at this time.

Equally in need of improved facilities and more room as the departments of Electrical Engineering and Engineering Drawing was the Department of Mechanical Engineering. Having enriched its curriculum by the addition of
technical options under the headings of Heat, Power, Automotive, and Manufactures Engineering in 1927, Dean C. C. Williams and Professor Huber O. Croft, Head of the Department, now recognized the almost immediate demands for more room and better equipment. The needs were made known to the Board of Education in January 1930, and on the twenty-first day of that month the Building and Business Committee was authorized to proceed with plans and specifications for remodeling the old heating plant to be used for a mechanical engineering laboratory. Because of the inadequacy of the building and the difficulties encountered in converting it into a satisfactory laboratory, remodeling plans were slow to materialize. Those closely associated with the department recognized the need for a "new laboratory" and to this end they directed their efforts with the result that on May 14, 1930, the Board of Education decided that the old heating plant should be wrecked and the site cleared for a new mechanical engineering laboratory.

Designed by Professor Huber O. Croft, the new building, upon completion, was one of the most modern laboratories in the country and indicated that a real program of development and expansion in mechanical engineering was soon to be witnessed. Bids for the structure were opened on March 10, 1931 at a meeting of a special
building committee to whom the matter had been referred. And two days later after considering the bids submitted, the Board of Education awarded the general contract to the Theodore Stark Construction Company of Cedar Rapids; at the same time, the contract for "structural steel and erection of the same" was awarded to the Iowa City Iron Works.

Accepted by the Board of Education on January 19, 1932, the new laboratory was a three-story building located just west of the Hall of Engineering. Approximately one hundred and fifty-one feet long and seventy-seven feet wide the floors of each story were spaced to allow unusually high ceilings for installation of piping, line shafts and other equipment. The power and metal technics laboratories were located on the first floor with the productions methods laboratory and a power laboratory, particularly adapted for experiments in research projects, located on the second floor. To encourage the graduate work which was started in the mechanical department in 1930, equipment similar to that used in modern steam plants was provided. Equipment for research work in internal combustion was also provided in a special laboratory located on the same floor. On the third floor the woods products laboratory, heating and refrigerating laboratory and the pneumatics laboratory were well equipped for both undergraduate and graduate study in the respective
fields. In addition to the laboratories on third floor there was a projection room equipped for showing pictures of manufacturing processes. With a building valued at over $89,000 and equipment worth approximately $70,000 the department of mechanical engineering like that of electrical and engineering drawing was prepared to take its place among similar departments in leading engineering colleges.

Attracting nation wide attention at the same time the various departments of Engineering were being re-located, expanded and improved, was the Hydraulic Laboratory. Herein experiments concerning flood protection, water storage, navigation, irrigation, water power, construction of bridges and other hydraulic problems of interest to engineers were being conducted. The work performed and the original investigation made in this laboratory was described by Congressman James O'Connor, in an address to the House of Representatives, as being "an outstanding example of the present work carried on by these hydraulic laboratories."

Under the direction of Professor Floyd Nagler, assisted by Professors S. M. Woodward, B. J. Lambert, and others hydraulic engineering which had been slowly developed through the efforts of Dean Raymond was greatly developed and expanded. Coming to the University of Iowa in 1920, Professor Nagler found not only an infant labora-
only partially completed but also a curriculum with only one course in hydraulics listed. So rapid was hydraulic development, however, that before a decade had passed, the Professor was associated with a department offering nineteen hydraulic courses and provided with a new and well equipped laboratory in which the manifold workings of research men were in progress. Following the untimely death of Professor Nagler in 1933, the laboratory was placed under the immediate direction of Professor F. T. Mavis, and "later under E. W. Lane."

Located on the west bank of the Iowa river the hydraulic laboratory began its operations in the spring of 1921, with new equipment made available for the first time with a series of tests on a proposed dam to be built by the Iowa Railway and Light Company of Cedar Rapids, on the Cedar river. The following year operations of the laboratory were extended and used by the federal government for the first time. At this time David L. Yarnell, senior engineer in the United States Department of Agriculture was instructed by the department to conduct experiments upon the flow of water through the pipe culverts. The success of these early experiments prompted other organizations to do experimental work and caused the graduate student enrollment to increase thus making more room and equipment necessary.

The first authorization to prepare plans for
the badly needed new and enlarged hydraulic laboratory was given by the Board of Education on April 12, 1926, and in 1928, the first of the three existing units was occupied. Need for even more room became apparent almost immediately as army engineers in 1929, began to avail themselves of the opportunity to study in advance, the problems with which they would be confronted in the development of the Mississippi river system. The studies being made in the laboratory required further improvements and for these, the Board of Education allotted ten thousand dollars on May 15, 1929. Smaller sums were allotted during the following biennium to "cover the cost of placing partitions on the top floor" to provide proper office and research rooms and also to "cover the cost of installing permanent metal gates for control of water in the experimental flume."

As the achievements of the army engineers and others became known, engineering representatives from all parts of the country sought to use the hydraulic laboratory at the University of Iowa. The use of the laboratory by the United States Geological Survey in 1930, for the work of gaging the Iowa streams, gave the University the distinction of having been the center of hydraulic research for three federal departments and eleven private organizations. Utilized to such extent it again became necessary to relieve the crowded conditions of the laboratory.
Accordingly, therefore, with an appropriation of "four million nine hundred thousand dollars" made by the Forty-fourth General Assembly for the University, with the provision that all "unallocated funds be distributed by the state board of education," with "not more than one hundred fifty thousand dollars being "expended for general improvements and special capital purposes," the Board of Education authorized the enlargement of the hydraulic laboratory, on June 21, 1932.

Work on the two new units was started during the summer of 1932. Located immediately to the south of the old unit a five story tower section and a three story wing that is practically a counterpart was constructed. Joined with the old unit the new addition, one hundred and five feet long and forty five feet wide gave the Iowa laboratory the largest operating floor space and the largest water capacity of any similar structure in the United States.

The need for the construction of the two units in 1932, was made more immediate and more necessary, perhaps, through the efforts of Professor Nagler to advance the usefulness of the hydraulic laboratory by making it available to more outside agencies and at the same time increase its value to graduate students, through the establishment of an organization on an independent basis. Upon his recommendation, President Jessup on May 26, 1931,
recommended to the Board of Education that a "Bureau of Hydraulic Research" be organized. Approved by the Board of Education the "Bureau" was established, however, on July 7, in consequence of the President's recommendation the word "Institute" was substituted for "Bureau," thus making the complete title the "Institute of Hydraulic Research."

According to a statement issued by the Board of Education the Iowa Institute of Hydraulic Research has been organized to afford an agency for the coordination of the talent, facilities and the resources that may be made available at the University of Iowa for undertaking projects of unusual magnitude scope or complexity in the field of hydrology and hydraulic engineering.

Investigations are conducted under the direction of the operating staff and cooperating engineers. The consultants from the cognate departments of the University faculty are available for counsel, either as a group or singly, concerning aspects of hydraulic problems which involve their respective fields. The practical engineering value of the research undertaken is advanced through the association with the Institute of an advisory committee of prominent practicing hydraulic engineers. A connecting link through which organizations and agencies were able to work with the University in hydraulic research the establishment of the Institute was followed by a great deal of research work dealing with the development of the Upper Mississippi river as well as work preformed by engineers from more distant parts of the country.
who availed themselves of the opportunities afforded to solve construction problems by "creating minature dams and mimicking the exact conditions of the actual stream."

More than a building or a group of earnest faculty members the Institute combined all of the many varied groups at work in the laboratory into a harmonious research body. Represented in its membership in 1940, were the following agencies: The United States Engineers Department under M. E. Nelson and Nolan Page, the United States Geological Survey under R. G. Kasel, and the United States Weather Bureau under B. S. Barnes. Each agency maintained a group of able men to assist in the experimental and routine work. In 1940, the Dean of the College of Engineering wrote:

Other cooperating agencies are the Reclamation Service, the Soil Conservation Service, the Bureau of Chemistry, and Agricultural Engineering, the Tennessee Valley Authority, the State Conservation Commission, and the National Association of Master Plumbers. In addition, model studies have been made for private companies and public organizations. The combined pay roll and expenses for the Institute amount to nearly $90,000 yearly in addition to the salaries and other costs paid from University funds. During the last four years, the number of men employed by the various groups all working together in the Institute has more than doubled. Every available square foot of space in the Hydraulic Laboratory is now fully used and last month part of the office work had to be moved to the Main Engineering Building.

The Institute of Hydraulic Research was described
by Dean Williams as "a notable stride forward" and in support of its nine thousand dollar request from the Forty-Eight General Assembly in 1938, the Board of Education made the following report:

The work in hydraulic research began in 1919 with the construction of the first unit of the Hydraulics Laboratory. By additions in 1924 and again in 1932 the present laboratory was produced. Since 1931 the work has been carried on under the title Institute of Hydraulic Research. The program deals with stream flow and control, stream gaging, currents, erosion, sedimentation and the use of water for all kinds of industrial purposes. For several years the research work was carried on under a cooperative agreement with the U. S. Department of Agriculture. Later and down to the present time, much of the work has been done in cooperation with the Engineering corps of the United States Army in connection with river and stream control, dams and other river structures. A large part of the money to sustain the work has come from grants made from time to time by the United States Army Engineering Corps and also from rentals paid by the Army Engineering Corps for space used by the Federal Government. Due to the fact that many of the federal projects have been completed and the new ones are being undertaken at other locations, the support funds have been greatly reduced. In order, therefore, to carry on the program unimpaired, it will be necessary to provide annually the amount of money requested.

The Institute of Hydraulic Research at the University of Iowa has attained nationwide distinction and is recognized as one of the best institutions of its kind in the country. Iowa, bounded on the east and on the west by two great rivers, and with many rivers and streams of its own, has a special need for well trained men as water engineers.

Particular importance was attached to the hydraulic laboratory in most every section of the state.
and the impossibility of developing hydraulic engineering at the Iowa State College was given as a strong reason for maintaining the College of Engineering in the University of Iowa when the attempts to have it disestablished were made. The general evaluation and popular conception of the hydraulic laboratory was stated in the Des Moines Register on February 5, 1939. Herein it was declared that the laboratory contained "complete equipment for the testing of lock systems, dams and erosion control measures," valued at $110,000 and was the "pride of the engineering school."

Having maintained "the high standards for which Dean Raymond strove" and having "attained more fully the position of leadership" for the College of Engineering, Dean Williams submitted his resignation in September 1935, in order to become President of Lehigh University located at Bethlehem, Pennsylvania.

After accepting, with regret, the resignation of Dean Williams the Board of Education appointed Byron James Lambert, Professor and Head of the Department of Civil Engineering, to the position of Acting Dean of the College of Engineering. This appointment, temporary in nature, came only after a long and brilliant career in engineering education and the incumbent declared he was "looking forward with a great deal of pleasure" to taking his "rubber cushion" and going back to his "old office on the top floor of this building - an office that has been a
real home to me for some thirty years."

Joining the engineering faculty in 1902, the new Acting Dean was its senior member and enjoyed an enviable record of achievement both as a professor and as a practical engineer. His success in the field of engineering education though recognized for many years by his colleagues and students was evidenced in the testimonial tendered him on the occasion of his seventieth birthday, April 25, 1944. On that day while enjoying the company of Civil Engineering Alumni, Engineering Faculty Members and friends of the College of Engineering at a formal dinner in the Triangle Club Ballroom, announcement was made of "The B. J. Lambert Scholarship Fund," established in his honor and

In recognition of his long and distinguished service as our teacher and administrator, of his many accomplishments in the field of Civil Engineering, and of his loyalty and devotion to the College of Engineering. In addition to his success as an engineering educator, Professor Lambert at the time of his appointment as Acting Dean had acquired a reputation by his success in designing and constructing dams, bridges, water works and hydro-electric plants. He also held the patent on an all-steel grandstand and designed the all steel stadium of the Universities of Iowa, Miami, and Washington and Lee. Rather unique and equally important among his achievements in the practical field was the construction of a railroad and ware-
house near Montierchaume, France, and a road and bridge near Verdun and St. Mihiel.

As Acting Dean, Professor B. J. Lambert stated that his "main desire" was to "acquaint the people of Iowa, particularly the High School boys, with the fact that there is an Engineering School at Iowa City." The fact that publicity and dissemination of literature pertaining to the College of Engineering was "more or less soft pedaled for a number of years - perhaps for financial reasons," had resulted in the loss of Iowa residents because of their enrollment in institutions outside of the state. That the trend was upward, however, and engineering development at the University was emerging favorably after years of critical economic depression is evidenced by the following enrollment table:

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<th>School Year</th>
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<td></td>
</tr>
<tr>
<td>1928-29</td>
<td>321</td>
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<td>1929-30</td>
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<td>1930-31</td>
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<td>26</td>
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<tr>
<td>1931-32</td>
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<td>1932-33</td>
<td>285</td>
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<td>1933-34</td>
<td>289</td>
<td>51</td>
</tr>
<tr>
<td>1934-35</td>
<td>307</td>
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<td>1935-36</td>
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<td>36</td>
</tr>
<tr>
<td>1936-37</td>
<td>406</td>
<td>29</td>
</tr>
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</table>

Perhaps, the enrollment decline evidenced in the early thirties was due more to the depression that gripped the entire nation and particularly the agricultural section, than to lack of information concerning the College
of Engineering at the State University of Iowa but because the latter could be a contributing cause, a publicity campaign was promptly inaugurated. To awaken an engineering consciousness among young men of the state a vocational guidance book written by former Dean Williams and entitled, Building an Engineering Career, was placed in all high school, college and city libraries in Iowa. The placement of the former Dean's book was followed by a thirty two page illustrated bulletin. Prepared under the direction of Acting Dean Lambert, this bulletin, in addition to containing views of the engineering buildings and class room scenes contained practically all the essential information for prospective engineering students.

To provide a more complete training and to enable a better diffusion of engineering knowledge through the teaching of properly arranged and properly coordinated courses, suggestions were made for changes in the curricula. After consideration of the suggestions in regard to curricular changes they were deferred until after the appointment of a Dean to fill the position held by Acting Dean Lambert.

The appointment of Francis M. Dawson, M. C. E., Head of the Department of Hydraulic and Sanitary Engineering at the University of Wisconsin, as Dean of the College of Engineering in the State University of Iowa, was
announced to that faculty on May 6, 1936, by President Eugene A. Gilmore. At the same time the President stated that the new Dean would report for duty on July first.

After graduating in 1910, from the Nova Scotia Technical College with the degree Bachelor of Science in Civil Engineering, Dean Francis M. Dawson enrolled at Cornell University and received the Master's degree in Civil Engineering. At the close of the First World War, during which he was engaged in active service with the Eighth Battalion of Engineers, Military Forces of Canada, Dean Dawson became a member of the teaching staff at Cornell University as Assistant Professor of Civil Engineering. In 1922, he became Professor of Hydraulics at the University of Kansas a position he retained until 1928, when he accepted the position from which he resigned at the University of Wisconsin in order to become Dean of the College of Engineering at the University of Iowa.

Author, Professor and Administrator, the advent of Francis M. Dawson to the College of Engineering gave to that college a Dean who was especially active in matters that pertain to engineering education and by training and experience admirably fitted to direct its course through a period when wisdom, knowledge, and vision were so greatly needed.

Very soon after assuming his duties, Dean Dawson
declared that a "high standard of scholarship" must be maintained, and that the "basic sciences of mathematics, physics, and chemistry together with good training in English composition are still the foundation of engineering work," giving not only a start for all future work but also a broader outlook upon life with a greater clarity of thought and expression. Accepting as, perhaps, the best definition of engineering to be "the science and art of directing the applications of the sciences in the economic utilization of the forces and materials of Nature for the use and convenience of Man", Dean Dawson reiterated the statement of Dr. E. E. Day of Cornell University, to express the general aims of a sound vocational education at University level:

But if the University is to engage in vocational education it should do so in ways becoming an institution of higher learning devoted basically to the intellectual life. This involves recognition of at least three governing principles: (1) an emphasis upon fundamental disciplines as distinguished from immediately applicable, narrowly concerned, practical technique; (2) a sustained pursuit, through scholarly and scientific research of new knowledge within the field of the vocational art; and (3) a steadfast recognition of the broader implications and social obligations of the vocation for which training is being provided. This is all tantamount to saying that vocational education at the university level should be essentially professional in character. It should, moreover, have a substantial cultural content. Soundly conducted professional education rightly conceived, need involve no conflict with the primacy of the university's intellectual function.
With a philosophy of engineering education that required the maintenance of high standards and methods designed for developing the ability to create and thus train rather than fill the mind, Dean Dawson and members of the engineering faculty by scholarship and devotion to duty sought to bring the College of Engineering to the full realization of its basic functions as part of a great State University — "the advancement of knowledge through all forms of research and creative work and the dissemination of knowledge mainly through effective teaching." Almost from the beginning of engineering education at the University of Iowa original investigation, in some form or another and on a varied scale, had been conducted by members of the faculty and students of superior ability. Not until the second quarter of the twentieth century, however, did "engineering research approach the University ideal." Beginnings of research in Engineering at Iowa may be found in the highly original articles contributed to the mathematical journals by Professor Philatus H. Philbrick and in the series of articles wherein he demonstrated the more simple methods for solving practical civil engineering problems than by the then commonly accepted use of logarithms. Under the direct supervision of Professor Charles D. Jameson, his
successor, assisted by E. W. Crelhin and J. H. Howe, of the senior class, research work consisted of a series of tests and experiments upon the "composition and strength of the various kinds of hydraulic cements upon the market of this country." Requiring more than a year for completion the tests attracted widespread attention and became known as the "State University of Iowa Cement Tests." Results of the tests were published in a monograph as volume three of The Transit. The lack of facilities and the existing problems that accompany material expansion and the formulation of engineering curricula in a university caused a limited amount of research work to be carried on in engineering during the first quarter of the new century. Following the advent of Dean Williams, in 1926, however, and particularly during the six or seven years preceding the Japanese attack on Pearl Harbor, research work was especially encouraged. In each department research problems were studied and reports, articles, and books published winning for the College of Engineering an enviable reputation in the realm of research.

Selected by the American Institute of Graphic Arts in 1939, as one of the best sixty text books of the year for the purpose of exhibiting "current text books of the highest artistic and technical excellence to the end that they may stimulate and encourage book manufacturers and inform and interest educators, thus helping to raise
the general level of text book production in this country was a book entitled *Drawing Board Geometry*, by Professor F. G. Higbee. Of equal importance perhaps, was the splendid work accomplished in the same department by the development of aptitude and achievement tests in engineering drawing. The first of their kind they measured with a high degree of accuracy and gave a system of tests that were well developed and a source of national recognition for the College of Engineering.

Among the numerous research studies made in the department of Civil Engineering, in addition to the twenty three graduate theses completed since 1930, were the studies completed by Professor E. R. Waterman, B. J. Lambert, C. T. G. Looney, C. J. Posey, and M. L. Ashton. Articles on "Sedimentation of Sewage" and "Sewage Treatment in Iowa City" were written for the *Sewage Works Journal* by Professor Waterman, who also published the results of special study in a book entitled *Elements of Water Supply Engineering*. As a result of conducting classes in National Defense Training at Rock Island, Professor B. S. Lambert published a book entitled *Airport Engineering*. He was also the author of a booklet on *High Masonry Dams*. Articles written by the same professor for *Proceedings of the American Society of Civil Engineers*, the *Iowa Engineering Society Proceedings*, and *Exponent*, included such subjects as "Masonry Dams Arched Down Stream," "A New
Type of Balcony Seating," "Diagrams for Designing Exterior and Interior Seatings for Theaters, Field Houses, Stadia, etc." For the Army Engineers, he wrote articles on "A New Method of Laying out a Field Grade System for Air Fields" and a "Simplified Method for Designing and Building Runway Intersections on Air Fields." On the "Multiple Steel Seat Plates for Grand Stand Construction," Professor Lambert secured a second patent. Professor C. T. G. Looney, after several years of research in the field of structural dynamics, especially with regard to the stresses and vibrations in Railway Bridges caused by moving loads, "developed rather novel analytical and experimental methods which promise rather definite results."

Among the problems of research in the fields of structural and hydraulic engineering which attracted the interest of Professor C. J. Posey the following may be mentioned: "(1) Designing corners for rigid reinforced concrete frames; (2) The determination of bond in a new type of reinforcing steel; (3) Tapered molds for concrete test cylinders; (4) Strength of wooden corners of different designs, etc." Professor Posey also wrote a number of articles which were published as monographs and in "Technical Journals." In conjunction with S. M. Woodward he wrote a book entitled Steady Flow in Open Channels. Although joining the staff very recently and engaged
primarily in the work of the Army Specialized Training
Program Professor E. L. Ashton made a series of special
studies for the Lincoln Electric Company of Cleveland,
Ohio, in "Structural Arc Welding," and wrote an article
for the Lincoln Arc Welding Foundation on "Arc Welding
Steel Plate Floors for Bridges and Viaducts."

In the Department of Mechanical Engineering
one of the first research projects of particular sig­ni­ficance was an experiment performed by Professor T. R.
Thoren in which he demonstrated that automotive fuel mix­tures produced by the "blending of alcohol and gasoline"
were unable to compete with straight gasoline on an
economic basis. Further research was made by Professor
Thoren in conjunction with Professor H. O. Croft in a
study of the use "of a slotted cylinder for ventilation".
Professor Croft and C. S. Schmarje conducted numerous
tests on boilers in 1935, to determine the decrease in
furnace efficiency caused by the accumulation of different
thicknesses and types of slag on boiler furnaces. In 1942,
Professor Huber O. Croft and Fred England, by "using radia­
tion and light measuring apparatus in small models of the
prototype boiler furnaces" determined the "characteristics
for emission and absorption of radiation of different shaped
boiler furnaces." Although this was the first time that such
model work was utilized it "proved the simplicity and appli­cability of the methods involved." Perhaps the most
significant research work conducted in the Mechanical department was that undertaken in 1939, on certain parts of battle ships and aircraft carriers for the United States Navy and the special work carried on in 1940, for the Bureau of Aeronautics. Reports and findings of this work are confidential and will not be published. During the decade following 1930, under the direction of Professor Ralph M. Barnes, special studies were made in the field of Industrial Engineering. Investigations were made in varied industries including laundries, canneries, hospitals, rubber companies, etc., in order to determine the easiest, most convenient and efficient way of performing the work required.

Investigation and research work in the Department of Chemical Engineering has for the most part been conducted by Professor Hubert L. Olin. His publications number approximately twenty-five articles and embrace the reports on coal and other fuel studies as well as "work on activated carbons, addition agents for electroplating, the bleaching effects of fuller's earth, carbon catalysis in gas purification, and the use of the swelling type of bentonite clays as coagulants for water, trade wastes and sewages." The major coal investigations have involved the use of pilot washing plants to study the possibilities of cleaning low rank Iowa coals. Professor J. H. Arnold
of this department performed research work that was largely in the general field of mathematical physics, specifically in the study of laws of diffusion of matter as it applies to the unit operations of chemical engineering."

In the Department of Electrical Engineering research has become an important aspect of the department's program. Research and other publications in this department by staff members and students since 1930, number fifty-two, eight of which are engineering books. Two of the books are research monographs, one is a handbook and five are college texts. Their quality is well evidenced by the fact that they have been generally adopted by the most highly regarded schools in the country. Titles of the books which contain the results of special studies are as follows:


Research in Television and related fields extended not only to the examination and the testing of many technical features; it also included an investigation of the whole range of broadcast programs. Development and experimental work had progressed sufficiently by 1941, to enable a demonstration of the system in operation. Potentialities of the system were studied by cooperating with the Speech Department. For the purpose of this study a "play was written, cast selected and trained, suitable makeup and costumes provided, lighting installed, etc. The sound and sight were picked up in the studio and reproduced in an adjoining room." Comments of Professor Edward C. Mabie, of the Speech Department and others present at the demonstration indicated that a "new connection channel was in the making." The War, however, brought the work in television to a sudden halt but with the almost certain large scale post-war development in commercial television the experimental work in this field very probably will presage an important place for the University of Iowa in the field of television.

Equally significant are the Valuation and Depreciation Studies made by Professor Kurtz, author of a
research monograph on the Mortality Laws of Physical Property and another in which the manner of using the laws in "actual valuation and depreciation estimating and accounting was presented" Professor Kurtz pointed the way in a field wherein many engineers and accountants devote full time. In 1942, two of the largest utilities in the nation, - the light and power industry and the gas industry, through a joint committee on Depreciation decided to adopt many of the principles and practices set forth in the studies. It is expected that in the post war period all industry in which depreciation and valuation problems are a significant factor in their operations will choose to adopt the recommended engineering approach.

In no department of engineering was research conducted so extensively as in Hydraulics. In this branch of engineering, research work resulted in the publication of approximately one hundred and sixty papers and reports by staff members of the Mechanics and Hydraulics Department and the Institute of Hydraulic Research. In the same field graduate student theses and dissertations presented numbered seventy. Of the one hundred and sixty papers and reports only ten appeared before 1930 and ninety seven appeared after 1939.

The investigations made in hydraulics during the decade preceding the attack on Pearl Harbor were "extremely productive and resulted in savings of many millions of
dollars in the construction of the numerous great river
projects carried on in the Mississippi, Ohio and
Tennessee River valleys during the period." All of
the Mississippi navigation dams and many structures in
more distant regions, were studied by model in the
hydraulics laboratory at the University of Iowa. Investiga­tions in this project involved:

- studies to prevent scour below dams, to create
  a distribution of velocities favorable to the
  passage of boat-tows through navigation locks,
- to determine the best methods of emptying and
  filling locks, to determine the capacities of
  large lock gates, to learn the best method of
  operating navigation pools above dams, and to
  determine the effect of river structures on
  flood heights.

In reference to this work nearly fifty reports were issued
by the United States Engineer Sub-Office and six theses
resulted from student work on models used in the investiga­
tion.

Twenty three papers and theses and nine govern­
ment reports resulted from the studies made on the "transportation of sediment by flowing water. The subject
commanded the interest of many engineers because almost
every where the deposition of sediment was destroying storage
capacity in the reservoirs constructed for power, naviga­
tion, water supply and recreation purposes.

Studies to establish the fundamental theory
of sediment transportation were begun, in­
vestigations of existing sediment samplers
were carried out, and, finally, the design
of accurate sampling equipment and a satis­
factory measuring procedure were perfected.
By research that was "purely fundamental in character" the Iowa Institute of Hydraulic Research played a leading role in the development of new experimental techniques for measuring turbulence and "demonstrated a close correspondence between the observed behavior of flowing water and certain statistical laws." Because of the important role played by turbulence in the flow of fluids a "complete understanding of its nature and development is prerequisite to more refined methods of analysis and design in several fields." In this regard the Institute of Hydraulic Research has made substantial progress and has made possible a more accurate analysis of such variety of problems as the transportation of sediment in rivers, the transfer of heat in boiler tubes, the warming and cooling by air currents of different localities on the surface of the earth, or the population of ships and aircraft.

In the development of turbulent research four significant papers, three discussions and a dissertation on the subject have appeared.

Research of a different nature to that previously carried on was initiated in 1936, as the result of an agreement with the National Association of Master Plumbers of the United States. For the purchase of equipment required for the research program the Association paid two thousand dollars. Concerned primarily during the first year with establishing the hydraulic
and pneumatic laws of pertaining to back-siphonage and the resultant pollution of the water supply the research program "showed conclusively the importance of back-siphonage through plumbing fixtures as a cause of certain water-borne diseases." Based on the results of the 1936, research program investigation was continued during the following year in an effort to develop standards and regulations for various siphon preventors and vacuum-breakers. Further research carried on during the same year was concerned with air conditioning apparatus with special reference to the protection of the public water supply from pollution.

The research in Hydraulics was equally productive and thorough in other projects. Eight publications, pointing out methods of reducing losses in pipes or of determining the scouring and filling characteristics of river bends appeared within the decade. While the hydraulic jump - "a phenomenon, which is capable of destroying a large portion of the kinetic energy in the rapidly moving water at the foot of a spill way," was made the subject of five research studies. Seven theses and papers on the subject of "Seepage flow through sand" provided a better knowledge and clearer understanding of the laws of permeability and made possible the proper designing of wells, levees, coffer dams, and earth dams all of which permit seepage flow. Studies on the behavior
of streams in flood, and on the relation of ground-water level to low-water level, and other allied hydrologic problems was made the basis of eleven papers and theses. Since the agreement for cooperation by the Iowa Fish and Game Commission entered on November 9, 1932, two bulletins on the subject of fishways have appeared. Proposed in them are designs that have proved to be much more effective than the conventional type in use at that time.

The amount of research work conducted, by members of the engineering staff and the graduate students, in all departments made the third decade extremely productive from the standpoint of engineers and raised engineering education at Iowa to a University level that claimed recognition not only in the United States but in foreign nations as well. Equally productive and deserving of equal recognition as research, perhaps, is the manner in which the College of Engineering was converted and geared to make the maximum contribution to national defense and the war effort.

Outlining in some detail ways in which the State University might be helpful in the National Defense Training Program Dean Dawson inaugurated a new program in the College of Engineering. His report having been adopted by the Board of Education on August 7, 1940, Dean Dawson on September 21, after reminding the faculty
of the College of Engineering that there was a great shortage of trained inspectors, radio and machine designers, and photography experts discussed various proposals for training men for national defense. Recognizing the need for national defense training and anxious to cooperate with the Federal Security Agency of the United States Office of Education, President Virgil M. Hanson endorsed the defense program by submitting the following recommendation to the Board of Education on February 14, 1941.

Whereas: The Federal Security Agency of the United States Office of Education in connection with the Engineering Defense Training, has set up a plan wherein it has requested the College of Engineering to set up a series of short courses for a limited time for concentrated training in various subjects of national defense as related to engineering, the Federal Government to pay all expenses for these short courses, including administration, supervision, instruction, instructional supplies and equipment and maintenance and operation of that part of the plant used for such instruction; now therefore

Be it Resolved, that the participation of the State University of Iowa in this plan be approved and that F. M. Dawson, Dean of the College of Engineering, be granted full authority to administer these courses in cooperation with the National Defense Training Program and provide the necessary staff of instruction with the understanding that all such expense is to be fully paid by the U. S. Government.

The need for defense courses was so great and Board approval of the recommendation was so undoubted that engineering defense courses were offered in January 1941.
Thus in accordance with the acts of the United States Congress, the College of Engineering at the State University of Iowa acting through the United States Office of Education arranged for and directed courses under the following programs: Engineering Defense Training, approved on June 20, 1940; Engineering, Science and Management War Training approved on June 30, 1942 and again on July 12, 1943.

In general, the programs were created to provide refresher and supplementary courses for those employed or those selected for employment in jobs essential to the national defense program. No tuition or fees were required and college credit was not allowed except in special cases and then only after the student satisfactorily passed a thorough examination over the content of the subject in which credit was sought.

The following "classification of Engineering, Science and Management War Training Programs" lists information relative to the number of courses offered, the enrollment and the beginning and ending dates,

**ENGINEERING DEFENSE TRAINING**
June 20, 1940-June 30, 1941

<table>
<thead>
<tr>
<th>Department</th>
<th>No. of Courses</th>
<th>Total Enrollment</th>
<th>Certificates Issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry and Chemical Engineering</td>
<td>2</td>
<td>49</td>
<td>37</td>
</tr>
<tr>
<td>Course</td>
<td>No. of Courses</td>
<td>Total Enrollment</td>
<td>Certificates Issued</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------</td>
<td>------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>2</td>
<td>99</td>
<td>94</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Radar Courses</td>
<td>2</td>
<td>216</td>
<td>92</td>
</tr>
<tr>
<td>Engineering Drawing</td>
<td>2</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>7</td>
<td>365</td>
<td>137</td>
</tr>
<tr>
<td>Mechanics and Hydraulics</td>
<td>2</td>
<td>38</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
<td><strong>814</strong></td>
<td><strong>361,162</strong></td>
</tr>
</tbody>
</table>

**ENGINEERING SCIENCE AND MANAGEMENT**  
**DEFENSE TRAINING**  
**July 1, 1941–June 30, 1942**

<table>
<thead>
<tr>
<th>Department</th>
<th>No. of Courses</th>
<th>Total Enrollment</th>
<th>Certificates Issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry and Chemical Engineering</td>
<td>9</td>
<td>170</td>
<td>76</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>2</td>
<td>54</td>
<td>34</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Radar Courses</td>
<td>24</td>
<td>778</td>
<td>425</td>
</tr>
<tr>
<td>Engineering Drawing</td>
<td>1</td>
<td>28</td>
<td>16</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>20</td>
<td>970</td>
<td>559</td>
</tr>
<tr>
<td>Physics</td>
<td>5</td>
<td>111</td>
<td>51</td>
</tr>
<tr>
<td>Engineering Problems</td>
<td>6</td>
<td>163</td>
<td>69</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>77</strong></td>
<td><strong>2282</strong></td>
<td><strong>1229,163</strong></td>
</tr>
</tbody>
</table>
### Engineering Science and Management
#### War Training
**July 1, 1942 - June 30, 1943**

<table>
<thead>
<tr>
<th>Department</th>
<th>Number of Courses</th>
<th>Total Enrollment</th>
<th>Certificates Issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Engineering</td>
<td>39</td>
<td>1011</td>
<td>725</td>
</tr>
<tr>
<td>Pre Radar Courses</td>
<td>(7)</td>
<td>(172)</td>
<td>(158)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>1</td>
<td>29</td>
<td>1</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>20</td>
<td>976</td>
<td>544</td>
</tr>
<tr>
<td>Physics</td>
<td>1</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
<td><strong>2039</strong></td>
<td><strong>1259, 164</strong></td>
</tr>
</tbody>
</table>

#### Engineering Science and Management
**War Training Programs**
**July 1, 1943 - June 30, 1944**

<table>
<thead>
<tr>
<th>Department</th>
<th>Number of Courses</th>
<th>Total Enrollment</th>
<th>Certificates Issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Engineering</td>
<td>9</td>
<td>339</td>
<td>84</td>
</tr>
<tr>
<td>Pre Radar Courses</td>
<td>(2)</td>
<td>(50)</td>
<td>(50)</td>
</tr>
<tr>
<td>Engineering Drawing</td>
<td>2</td>
<td>50</td>
<td>21</td>
</tr>
<tr>
<td>Mathematics</td>
<td>1</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>18</td>
<td>754</td>
<td>265</td>
</tr>
<tr>
<td>Physics</td>
<td>1</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>1177</strong></td>
<td><strong>320, 165</strong></td>
</tr>
</tbody>
</table>

In addition to the Engineering Science and Management War Training Programs, the Army Specialized Training Program was organized in the College of Engineering in...
accordance with United States Army specifications and rulings. Students were selected and assigned by the United States Army and the College provided curricula in chemical, civil, electrical and mechanical engineering with all courses organized at the college level. In addition to the curricula provided in the four fields for three or four terms a "special term known as 4-A was provided for students whose previous training did not immediately qualify them for entrance into Term 4. Following the completion of Term 4-A, students were enrolled in one of the Term 4 curricula.

On April 23, 1943, Dean Dawson reported to the College of Engineering Faculty that five hundred basic trainees would arrive at the University of Iowa between May 3, and May 10, to start on a series of twelve week terms. These men it was stated would not be engineering trainees but it was expected that the majority of them would go into Engineering upon completion of the basic training. Indications were that men promoted from the basic work would remain at the University for engineering training. The following schedule shows the programs and the initial enrollment in the Army Specialized Training Programs in the College of Engineering.
Advanced Engineering (Different students)

<table>
<thead>
<tr>
<th>Term</th>
<th>Start Date</th>
<th>End Date</th>
<th>Graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-A</td>
<td>August 9, 1943</td>
<td>October 30, 1943</td>
<td>115</td>
</tr>
<tr>
<td>4</td>
<td>August 9, 1943</td>
<td>October 30, 1943</td>
<td>77</td>
</tr>
</tbody>
</table>

Chemical Engineers 35  
Civil Engineers 15  
Electrical Engineers 10  
Mechanical Engineers 17

November 8, 1943 - January 29, 1944

Civil Engineers 37  
Electrical Engineers 34  
Mechanical Engineers 37

Term 5  
August 9, 1943 - October 30, 1943

November 8, 1943 - January 29, 1944

Chemical Engineers 34

Term 6  
February 7, 1944 - April 29, 1944

Term 7  
To be announced

Graduate Engineering (different students)

Terms:  
August 9, 1943 - October 30, 1943  
November 8, 1943 - January 29, 1944  
February 7, 1944 - April 29, 1944

The work accomplished in the Army Specialized Training Program was in general satisfactory and in acknowledgment of the fact the Faculty of the College of Engineering adopted a resolution on November 1, 1943, in which it was stated that the faculty approves and authorizes the granting of credit in the College of Engineering for courses completed in the various programs of the armed forces of the United States, offered under the auspices of the college and instructed
by the University staff, subject to the usual policies and regulations followed in the acceptance of credit. 173

Engineering education has been subjected to a severe and searching inquiry both from the viewpoint of method and finished product. Pre-war education was not found wanting in its fundamentals and from the standpoint of true engineering education the program initiated by the Army was not satisfactory. Accelerated to such great speed it eliminated practical training in industry and in the field in connection with the college work and gave no time "to mentally digest the information presented to them in the classroom." The College of Engineering after cooperating with the Army in the specialized program made necessary for the immediate purpose of war stands ready and looks forward to September 1945, when the accelerated schedule will be discontinued and a return to a more normal program begun.
Chapter VIII

STUDENT ORGANIZATION AND ACTIVITY

Engineering students at the University of Iowa long felt the need for an organization wherein they could interchange ideas on topics pertaining to their branch of study, but not until January 18, 1886, did they succeed in organizing themselves into an "Engineering Society" for the purpose of discussing engineering and scientific problems. On that date members of the engineering faculty and a majority of the engineering students assembled in Professor C. A. Eggert's room and founded an Engineering Society, electing Mr. C. R. Rall, president; Mr. J. M. Fawcett, vice president; and Mr. Frank Cotton, secretary and treasurer. Following the election of officers two papers were read by engineering students. The first by Mr. Walter Bryant, was a thorough and scientific treatment of the subject, "Foundations by the Pneumatic Caissons," and in the other on "Stone Bridges," Mr. J. M. Fawcett by using "numerous well prepared drawings" gave an illustrated and accurate account of the principles employed.

Because of the society's small membership the enthusiasm manifested at the meeting on January 18, soon began to lag and after March, 1886, the society ceased to exist. The benefits to be derived from such an organization nevertheless remained obvious to the more thoughtful
students and became more apparent to others as the number of engineering students increased and facilities for engineering education were improved. The need for a student organization was felt sufficiently strong again on October 15, 1889, and on that date another Engineering Society was organized. In the newly-organized society members were divided into three groups or classes, - the active - to which all students of the engineering course might belong; the graduate, - composed of members who had graduated from the University and the Engineering Society; and finally the honorary, - to which persons connected with engineering were eligible. Meetings of the members of the Society were held every Tuesday evening in Professor Charles D. Jameson’s lecture room and each was divided into two sessions, - open and closed. The former, to which the public and all interested in engineering were invited, consisted of a program during which an essay on some engineering or allied subject together with reports from such periodicals as Engineering News, Engineering Journal, or Railway Age were read and discussed. In the second or closed session only members of the organization were admitted and in this part of the meeting business pertaining to the Society was transacted.

Organized and maintained to foster better and more effective engineering education, the Engineering
Society, almost from the beginning "proved to be very beneficial". To further fulfill its purpose members agreed on November 26, 1889, that the Engineering Society, like similar societies in other large and progressive Universities should publish a Bulletin, containing the most valuable papers presented at the meetings and the accounts of original research made by members of the society. It was also planned to exchange the publication with other engineering colleges in the United States and Europe in order to enable engineering students at the University of Iowa to become acquainted with the results of current research studies and problems, in other institutions. This exchange of publications gave an advantage to Iowa students not available to many practical engineers.

Plans to publish the bulletin were announced in the Vidette-Reporter, on February 15, 1890, and on March 11, Professor Charles D. Jameson appeared before the Board of Regents and requested that the "Engineering Chair" be permitted to publish at University expense, a "Scientific Journal", to be called, The Transit. After hearing the Professor's request the Board of Regents referred the matter to the Executive Committee, "with power to act."

At the same time the Secretary to the Committee was authorized to prepare specifications in regard to the publication and secure bids from printers in Iowa City. In his report the Secretary requested that bids be made
by the page, on fifteen hundred copies of eighty pages each, with the paper, type, workmanship, and binding similar or equal to the University Catalogue. In accordance with the secretary's request bids from the following printers were submitted and on March 20, 1890, opened by Mr. Burrell.

A. J. Hershire Co. $2.12 per page
Star Job Office, 1.73 per page
H. F. Beuter Republican Company, 1.70 per page
Iowa City,

Having submitted the lowest bid the contract for "furnishing and printing," The Transit was awarded to the Republican Company. Although the engineering bulletin was published at "University expense, The Transit staff assisted in defraying the cost of publication by selling advertising. In this regard Professor Jameson reported to the Executive Committee, on April 26, 1890, "that the cash ads would amount to $33.00 and benefits in the way of Exchange ads would be equal to $59.00 more. He was instructed to collect the cash items and pay the same to the secretary and take his receipt."

The first copy of the new engineering bulletin was published in April, 1890, under the editorship of the Engineering Society with Hubert Remley and Calvin A. Lichty as managing editors, and Alden Brown and Arthur Cox, associate editors. As stated in this issue the objects of the publication were:
To preserve a record of the proceedings of the Society; to publish the papers read before the Society, so that they may be exchanged for similar publications for the benefit of the Engineering Library; to record the results of experiments and original investigations made by students in the Engineering course to publish information regarding doings of our Alumni; to set forth the advantages offered by the State University and particularly those in the Engineering course and to promote the interest of the same.

Appropriate, indeed, was the "Arms" of the Engineering Society, designed by Calvin A. Lichty and used on the front cover giving indications at once that the new publication was prepared to further enhance the nobility of the engineering profession by its scholarly contents. Heraldic significance of the "Arms" was described by Dr. J. G. Gilchrist in the following manner.

The "dexter chief," in silver, is charged with engineering instruments, represents the living parent of all forms and degrees of engineering science. The division of the shield "party per pale," indicates that the divisions and charges are borne "by courtesy" during the life of the paternal parent. The subordinaries are thus described. The "sinister chief," sable, fillet of cadency, charged with gas engine and gearing, argent proper, is the eldest son, Mining Engineering. Or with Crescent, argent, of cadency, charged with mining tools, and representation of mining, all proper is the second son, Mining Engineering. Azure, with star of cadency, argent, charged with stand pipe and dam, proper is the third son Hydraulic Engineering. Sinister base, gules, with sparrow of cadency, argent, charged with thunder bolt and telegraph wires, all proper, is the fourth son, or Electrical Engineering. Dexter, "party per fess," vert, with annular ring of cadency, argent, charged with sewer, pipes and trap, all proper is the fifth son, Sanitary Engineering. Dexter base purpure with trefoil of
cadency Argent charged with Ancient and Modern Architecture, proper, is the sixth son, or collateral kin, Architecture.

Helmet of royalty, surmounted by Pyramid, for Great, shows royal lineage of great antiquity.

Supporters, Dexter, tripod and transit poles; Sinister, level, rod and axe. 22

No less significant and appropriate than the design on the cover page was the content of the bulletin, concerning which a writer for the Vidette Reporter wrote:

A glance at the table of contents is sufficient to warrant us in saying that the articles in this first issue will contain a great deal of information, and amply repay a careful reading. The students of other departments often wonder what the engineers study. Let them read this bulletin and they will open their eyes at the energy displayed in this department.

In looking over the contents of the new periodical, we notice articles on "Iowa City's Sewerage," "The University Cement Tests," "Location of Bridges," "Belle Plaine Well," "A Practical Transition Curve," and besides the above mentioned there are other carefully prepared articles, which space will not permit us to enumerate. There is an admirable description of the several chairs of the University, which are connected with the Engineering department. This makes The Transit a magazine of about eighty five pages, somewhat longer than was first intended. 23

It was stated in the first number of The Transit, that future publication would be semi-annually and that the second number would be published in June, 1890, however, despite the announcement it was not received, from the printer until the following December. It is to be further noted that during the early years, publication of The Transit was rather irregular, being published apparently
on no specific date and being omitted completely in 1892 and again in 1894. Another characteristic to be noted is the fact that in the beginning two numbers constituted a volume regardless if they were issued in the same or different years. The third volume however, published in 1895, was devoted to a one hundred and eighty five page monograph by Professor Jameson, on the cement tests made in the testing laboratory. The irregularity observed in The Transit's publication during the years immediately following the appearance of the first issue was very probably due to the lack of available funds caused by the economic and financial depression experience during those years and reflected in the general appropriations for the University.

Under the editorship of the Engineering Society publication of The Transit was continued until 1909. During that year the Engineering Society was a defunct organization and consequently the College of Applied Science sponsored the annual publication. Causes for the death of the organization may possibly be found in a spirit of parochialism that developed and caused students to confine their interest to lesser societies or departmental organizations in which they were enrolled rather than in what may be termed the all-embracing Engineering Society whose membership comprised all students registered in the College of Applied Science.
The demise of the Engineering Society was considered unfortunate by Dean Raymond and at once he became instrumental in founding the "Associated Students of Applied Science." Founded at a meeting of the engineering students in the Liberal Arts assembly hall on January 24, 1910, the Associated Students of Applied Science, was established in order to afford a means of uniting all engineering students and at the same time provide some organized body to take charge of engineering activities. Through this association it was hoped to do away with the formal side of college organization by substituting for it activity on the part of every student for the benefit of all in order to bring about a more intimate relation between students; to effect a pure democratic government which would be authorized to transact all business and arrange for college events and last, but not least, to develop it gradually into an engineering society at the meetings of which technical topics may be discussed by the students. It is hoped that this organization will develop an early interest in every student for his profession, teaching him to cooperate with people of like interests and ideals. Such an organization furthermore would do much to broaden the student's views of life and afford an excellent opportunity to foster in him a spirit of cooperation and sociability.

Comprehending well the purpose of the organization, engineering students attending the initial meeting on January 24, 1910, elected W. P. Rawn, President; M. R. Morris, Vice President and J. H. Wagner, Secretary. At the same meeting, Joseph Richmond was elected editor-in-
chief of The Transit and E. H. Bailey, manager. In a critique of the Association's activities, under the leadership of the first group of officers during the months which followed its organization until the end of the school year in 1910, it was stated that:

The plans for regular literary meetings have virtually been postponed until next year. But the unusual success of the first undertakings of the Association predicts a bright future to its activity. The spirit manifested during the first annual engineering celebration on March 17, of this year, 1910, the attendance at the annual engineers banquet, the intimate acquaintance of the upper and lower classmen brought about by these events, the new engineering pin, - all these are indications that the engineers are a live bunch, and if they want to do something they can do it properly.

Perhaps the most pertinent activity of the Association was the first "legal" engineering celebration which took place on March 17, 1910, with activities that were the "creation of a tradition." Having its origin in the newly-organized Associated Students of Applied Science, the idea of a celebration received the approval of Dean Raymond, and thus "the great memorial day of the patron of the engineering profession, St. Patrick, who is universally acknowledged as the traditional founder of the profession" was observed. The first celebration consisted of a parade, in which each class and department contributed a novel stunt, and a free vaudeville show in the evening. Of a parody on "School Days" it was said that the show was an "excellently plotted caricature of
a primitive country school, the life of which was shrewdly interwoven with popular university incidents. Fancy dancing and original songs adapted to popular music were a special feature of the vaudeville. Viewed by almost five thousand enthusiastic spectators the colorful and novel parade was no less successful than the show presented in the auditorium to a capacity house and from which students and townsmen seeking admission were turned away.

In this initial Engineering Celebration the standards were set and a tradition created for engineers to maintain and perpetuate in the year ahead. Loyal to their college tradition, and cherishing their festive inheritance, the engineers at the University of Iowa, in the years that followed, have united annually to surpass the efforts of their predecessors, at the same time retaining their spirit and endeavoring to fulfill in greater measure the purpose they sought to achieve. Intent as were the engineers upon perpetuating the memory of their "Patron Saint," they were very soon confronted with the vehement opposition of "the well meaning Irish of Iowa City" protesting "against the defamation of their Patron Saint." In consequence of the protests shortly before the celebration scheduled for March 17, 1913, Dean Raymond issued practically an ultimatum, in his usual kindly and diplomatic way, to the effect that the name of the celebration
must be changed, and suggested that the day also be changed.Difficulty was not encountered in changing the date, but to select an appropriate name was quite a different matter. Finally, however, after much speculation and "much tearing of hair and gnashing of teeth," Mr. A. C. Boer and Mr. A. N. Hanson, while visiting in Professor Dunlap's office, were given the "Underlying idea of using the initials of the College of Applied Science, the State University of Iowa and the courses of engineering available in the College of Applied Science. Thus was pieced together the name "Meccasacus." Symbolical of engineering at the University of Iowa the name also suggested a pilgrimage on the part of the alumni back to their Alma Mater.

The letters M-E-C-C-A are symbolical of the main divisions of engineering; namely, Mechanical, Electrical, Civil, Chemical, and Architectural. The remaining letters, S-U-I-C-A-S represented State University of Iowa, College of Applied Science. The last group of letters was soon dropped to form "MECCA."

The date for the first Mecca Day was set for March 18, and on that day the annual St. Patrick's celebration was replaced. Although, the engineers lost their date and the name for their celebration they lost none of the tradition or enthusiasm manifested in former years. On the contrary, the scope of the traditional celebration was enlarged and made to include an exhibit of the work
performed in the Engineering College and the annual engineering banquet, which since 1902, had been held near the close of the school year. In regard to the first exhibition it was stated that:

From two o'clock to five the doors of the engineering building, shops and laboratories were open for visitors, and many people for the first time realized just what an engineer was and what he could do. Guides were furnished who escorted the parties and explained all the different features. Class rooms were visited, drawings were on exhibition, blue prints made; in the steam laboratory students were busy running tests on the different engines; in the shops the whir of buzz saws mingled with the clang of anvils from the forge shop, and the popping of student built gasoline engines. Surveying parties were at work on the campus, and their methods were explained. Then there were all sorts of stunts and exhibits in the electrical engineering department, from wireless lights and a complete telephone exchange to electric fire works and real electric ladies.

The banquet was held in the Commercial Club rooms on March 17, with practically the entire faculty and student body in the College of Applied Science as well as a surprisingly large number of alumni attending. With excellent food and an "equally excellent program of toasts" the most prominent characteristic of the banquet, perhaps, was the display of enthusiasm, pep and loyalty. This spirit which pervaded not only the banquet but also the preparations and staging of the celebration on the first Mecca Day was described in the following manner.
The unselfish manner in which our engineers have performed the tasks incident to their annual celebration, and the prolonged effort which they have extended to make the whole project a success, typifies the wholesome spirit of the engineering profession as it is taught and understood at Iowa.

The idea of accomplishment prevades every detail of the event. The dispatch and completeness of the undertaking is due to a spirit of labor, sacrifice and achievement. The first thing done was to lay the plans for this day. The next thing was to bring, to practical completion the plans and ideas adopted. This was no small matter for there was much to do and considerable expense to be incurred. Today, the work has been done and the expenditures made, not by a few of the engineers but by a united school that has for its dominant purpose the doing of tasks.

The work of the engineers is in the strictest sense, inspirational. Every man in the University who fails to appreciate the fundamental work of the sort of training and spirit which makes the engineers set about to finish a job with their best ability and ingenuity does not understand one of the first elements of successful endeavor.

The same spirit, together with the social and educational activities which characterized the first Mecca Day were manifested without substantial change each year after 1913, until 1926. In that year the "Mecca Parade" was replaced by the "Mecca Ball," the "high spot" of which was the presentation of the Mecca Queen, who presided over the Ball. Each succeeding year seemed to enrich the "College's Oldest Tradition" and in 1937, it was declared:

The original purpose of Mecca has been well fulfilled, and Mecca has become a tradi-
of the Engineering College. The present program, though, somewhat different from the original St. Patrick's Day celebration, carries that same underlying spirit of cooperation in work, and in play which made the first Mecca Day a success. 54

The success of the Associated Students of Applied Science so manifest in the social activities was soon evidenced in the more decidedly educational endeavors. Most notable achievement, perhaps, in addition to sponsoring lectures on engineering subjects, was the publication of The Transit. Maintaining the same high ranking it had enjoyed among engineering journals prior to 1910, The Transit was published until 1921 without substantial change in form or nature. In May of that year, however, it was decided by the Associated Students of Applied Science that The Transit should be published as a monthly periodical,

giving an account of all doings of the students of the College of Applied Science, to publish the results of the original investigations of the students doing graduate work in Engineering or at least an abstract of the same, and in addition to publish such articles of engineering interest as are contributed by the faculty and alumni. 55

The change, which did not entail a deviation from the purposes stated in the first number, was made because

The Engineering Library is now past the point where it is necessary for the students to secure publications for its files and the papers of the reorganized
Engineering Society are not usually of the kind that lend themselves either in length or in original investigation to publication.

The more frequent publication and the change in regard to the contents of The Transit, decided upon by the Associated Students of Applied Science in their final meeting before the close of school year in 1921, was followed by a change in government at the initial meeting of the next school year. Meeting on October 4, 1921, permission was granted "for the formation of a guiding board similar to that of the other University publications as requested by the Senate Board of publications." As an instrument of government for the new board the following "Transit Constitution" was prepared and adopted by the Associated Students of Applied Science on February 9, 1922.

I. The Transit Board shall consist of eight members as follows: (a) The Vice-President of the Associated Students of Applied Science who shall act as chairman. (b) The Treasurer of Associated Students of Applied Science who shall act as Secretary and Treasurer of the Board. (c) Two members of the faculty who shall be appointed by the Dean of the College of Applied Science, and shall serve for such term as the Dean shall see fit. (d) The Editor-in-Chief and Business Manager of the Transit shall both be members of the Transit Board but shall have one vote jointly. (e) Two members to be chosen by the above:

1. One member to be a graduate of the College of Applied Science of the State University of Iowa.
2. The other member to be a member of the Associated Students of Applied Science but
not an officer of the Associated Students of
Applied Science or a member of the Transit Staff.

II. The Transit Board's duty shall be to
tcontrol the editorial and financial policy of
the Transit. The Transit Board shall have com­
plete control of the disbursement of all of the
receipts of the Transit including assessment,
subscription and advertisement receipts.

III. A meeting of the Transit Board may be
called at any time by the chairman, a faculty
member of the Board, or the Editor-in-Chief or
Business Manager of the Transit by giving all
members a notice of the meeting forty-eight hours
in advance.

IV. The Transit Board shall, before the first
day of April of each year, select and appoint the
Editor-in-Chief and Business Manager of the
Transit for the following year. These appointments
to be subject to the approval of the Associated
Students of Applied Science. It shall be the
policy of the Transit Board, if advisable, to
choose the future Editor-in-Chief and Business
Manager from the existing staff of the Transit.

V. The Transit Board shall arrange, with the
Editor-in-Chief and Business Manager, an agree­
ment covering the period for which they are in
office, whereby no compensation shall be allowed
them which shall cause an assessment of more than
one dollar year per member of the Associated Stu­
dents of Applied Science.

VI. A quorum shall consist of sufficient mem­
ers to cast five votes.

VII. This constitution may be revised, amended,
or discontinued by the will of the members con­
stituting five votes, and the approval of the
Associated Students of Applied Science. Such re­
vision, amendment, or annulment to be posted on
the bulletin board of the College of Applied Science
at least two weeks before action by the Transit
Board.

VIII. This constitution shall become ef­
fective upon the approval of the University Senate
Board of Publications and the Associated Students of Applied Science, and the signatures of the presidents of both organizations. So

From the beginning success attended, in great part, the undertakings of the Associated Students of Applied Science, because perhaps, members recognized their responsibilities as part of an association organized to govern engineering students and engineering activities. Importance of attending meetings was stressed in the following editorial.

It has been noticeable in the last few years that the attendance of the lower class men at the meetings of the Associated Students of Applied Science has been decreasing. It is not evident, however, whether this lack of attendance is due to a lack of individual responsibility or to a lack of a sense of importance of the meetings.

No matter what the reason for this non-attendance may be, there should be three or four times as many attending the meetings as attend at present. The meetings of the A. S. of A. S. are called to attend to business affecting all the students in the College of Applied Science. Undoubtedly the business is attended to correctly and efficiently, but it would be much easier for the officers of the Association if they knew that they had votes of the majority of the students behind them in carrying out business instead of merely of such of the upperclassmen as felt their interest in the matter and turned out. It may be well enough to complain afterwards that the attendance at a meeting authorizing any particular action was not large, but it rarely is large and the only remedy is to have more students turn out in all classes.

Every student should feel that it is up to him to attend all meetings of the A. S. of A. S. because they attend to business that vitally
affects him. In particular the freshmen should not feel that the business is something that they know nothing about and does not concern them. The only way for them to prepare for the assumption of the burdens of school affairs is for them to start in their earlier years and gradually pick up the thread of affairs. The business of the A.S. of A.S. is as important to Freshmen as it is to Seniors.61

Explanation for the lag in interest and the failure to attend meetings of the Associated Students of Applied Science seems to be found in the fact that students were neither paying their membership dues, nor subscribing to The Transit. To remedy this growing abuse the Associated Students of Engineering, — the name of the organization having been changed in December, 1927, following the substitution of the title, "College of Engineering" for "College of Applied Science," — recommended that "one dollar be added yearly for each student in the College of Engineering, effective September, 1933, to be used as a subscription to the engineering publication." The recommendation was approved by the Board of Education on May 22, 1932. Further action was taken in regard to the Associated Students of Engineering by the Board of Education on May 28, 1936. At that time, upon the recommendation of President E. A. Gilmore, "one dollar was added to the annual fee for each student in the College of Engineering to be used as dues to the organization of Associated Students of Engineering in connection with their
activities, it being understood that this fee will be administered through the accounts of the comptroller of the State University in connection with other student activities.

Second to the Associated Students of Engineering in importance, yet preceding it by one year in existence, was the Iowa Beta chapter of Tau Beta Pi, honorary engineering fraternity. The fraternity was founded originally at Lehigh University by Professor E. H. Williams, who felt that there should be some honor conferred upon men who have attained high rank in scholarship in engineering. He felt, too, that the possibility of attaining such honor would inspire the students to greater effort and thus raise the scholarship standards of the college. A third and no less object in the foundation of Tau Beta Pi was to bring the most promising undergraduates into closer touch with the faculty, both for the purpose of harmonizing ideals in college work and in order to bring home more surely to men who were determined to be successful engineers the spirit of loyalty to their Alma Mater.

The Chapter was installed at the University of Iowa on March 30, 1909, by Professor H. C. Ford of the Iowa State Agricultural College. Establishment of the Tau Beta Pi Chapter on the Iowa Campus was indicative of the high grade of scholarship maintained in the College of Applied Science and membership therein was recognized as one of the highest honors conferred on any undergraduate in the College of Applied Science and after
1927, in the College of Engineering. Since its beginning Tau Beta Pi has been to engineering what Phi Beta Kappa is to liberal arts and its purpose as stated in the preamble is

to mark in fitting manner those who have conferred honor upon their Alma Mater by distinguished scholarship and exemplary character as undergraduates in engineering—
and to foster a spirit of liberal culture in engineering colleges of America.

To be eligible for membership in Tau Beta Pi students must be in good standing and rank in the upper eighth of the class as a junior or in the upper quarter of the class as a senior.

Other organizations in the College of Engineering having as their avowed purpose "to foster the high ideals of the engineering profession, to stimulate interest in coordinate departmental activities and to promote the welfare of its members" are the national mechanical engineering fraternity, Pi Tau Sigma, organized under the leadership of L. C. Englehart, Professor Hubert O. Croft and Professor Ralph M. Barnes, in 1935, and the Eta Kappa Nu, national electrical engineering fraternity, installed in the college in 1939 with William Hills as its first president.

Honorary fraternities and Associated Students of Engineering have in general the same objective — to further the desirable aspects of education in the College
of Engineering, the thoroughness of which may be concluded from a statement made in 1940, by the Dean of the College wherein he declared that "there never has been a time when our graduates were in greater demand.... University of Iowa Engineers have for the most part done extremely well in securing jobs even in depression years.... We may therefore look forward to the desirability of maintaining high standards in the College of Engineering."
INTRODUCTION

FOOTNOTES


8. Ibid.

9. Ibid.

10. Ibid.


13. Ibid.
Chapter I

FOOTNOTES


5. *Ibid*.


15. *State University of Iowa Catalogue*, 1873-74, p. 36.


22. Included in the Report of the President of the State University to the Board of Regents, Dec. 20, 1871, pp. 63-64.

23. Ibid.


26. Ibid., March 25, 1872.


28. Report of the Committee on the Course of Study, George Thacher Chairman, 1873, University Archives, MS.

29. Ibid.

30. Ibid.

31. Minutes of the Faculty, 1860-81, February 21, 1873, p. 331.

32. Ibid.

33. Ibid.

34. Ibid.


36. State University of Iowa Catalogue, 1872-73, p. 45.

Chapter II

FOOTNOTES


4. The State University of Iowa Catalogue, 1874-75, p. 23.


7. Report of Professor Philbrick to President Thacher, October 23, 1875 MS.

8. The State University of Iowa Catalogue, 1874-75, p. 24.

9. F. E. Higbee, "These Fifty Years", The Iowa Transit, Vol. XLIV, No. 5, February, 1940, p. 3.


11. Ibid., pp. 38-42.

12. Ibid., p. 30.

13. Report of Professor Philbrick to the Board of Regents, March, 1876, MS.

14. Report of Professor Philbrick to President Thacher, June, 1876. MS.

16. The State University of Iowa Catalogue, 1874-75, p. 16.

17. Ibid.

18. Ibid., pp. 17-19.

19. President Thacher, "Report to the Board of Regents", Report of the State University of Iowa, September 15, 1875, p. 21.

20. Faculty Memorial to the Board of Regents, June 21, 1876, MS.

21. President Thacher, "Report to the Board of Regents," Report of the State University of Iowa, October 1, 1875, p. 21.

22. Ibid., September 15, 1875, p. 21.


24. Report of Professor Philbrick to President Thacher, 1876, MS.

     The names of the students were Cassius C. Vanarsdal, Oliver H. Buckman and John F. Polley.

25. President Thacher, "Report to the Board of Regents" Report of the State University of Iowa, September 15, 1873, p. 31.

26. Faculty Memorial to the Board of Regents, June 21, 1876. MS.

27. Ibid.

28. Ibid.

29. Ibid.

30. Ibid.

31. Minutes of the Board of Regents, Book B, June 21, 1876, p. 17.

33. **Report of Professor Philbrick to President Thatcher**, June 26, 1875, MS.

34. **Minutes of the Board of Regents**, Book A, March 4, 1874, p. 454.

35. **Ibid.**

36. **Report of Professor Philbrick to the Board of Regents**, November 1875, MS.

37. **Ibid.**, June 25, 1875.

38. **Ibid.**

39. **Ibid.**

40. **Ibid.**

41. **Minutes of the Board of Regents**, Book A, June 25, 1875, p. 483.

42. **Ibid.**

43. **Ibid.**, June 26, 1875, p. 487.

44. **Ibid.**

45. **Ibid.**

46. **Ibid.**, June 29, 1875, p. 510.

47. **Report of Professor Philbrick to the Board of Regents**, November, 1875, MS.

48. **Ibid.**

49. **Ibid.**

50. **Laws of Iowa**, 1876, p. 166; **The University Reporter**, (Iowa City) Vol. VIII, April 15, 1876, p. 98.

51. **Minutes of the Board of Regents**, Book B, June 21, 1876, p. 78.

52. **The University Reporter**, (Iowa City) Vol. IX, July 14, 1877, p. 113.
53. Minutes of the Board of Regents, Book B, March 7, 1877, p. 29.


55. Minutes of the Board of Regents, Book B, March 7, 1877, p. 29.

56. The University Reporter, (Iowa City) Vol. IX, July 14, 1877, p. 113.

57. Minutes of the Board of Regents, Book B, June 21, 1877, p. 53.

58. Ibid.


60. Minutes of the Board of Regents, Book B, December 4, 1877, pp. 57-58.

61. Ibid., March 5, 1878, pp. 63-64.

62. Report of Professor Philbrick to the Board of Regents, March 6, 1878, MS.

63. Ibid.

64. Ibid.

65. Ibid.

66. Ibid.

67. Ibid.

68. Ibid.

69. Minutes of the Board of Regents, Book B, March 6, 1878, p. 66.

70. Ibid., p. 80. In a letter under the date of May 18, 1878, Josiah L. Pickard accepted the appointment. His acceptance was reported to the Regents on June 14, 1878.
71. Ibid., June 18, 1878, p. 99.


73. Report of Professors Hinrichs and Philbrick to the Board of Regents, June 19, 1888. MS.

74. Minutes of the Board of Regents, Book B, June 20, 1886, p. 333.

75. Ibid., March 1, 1887, p. 425.


77. Minutes of the Collegiate Faculty 1860-1881, June 22, 1878, p. 481.

78. Ibid.

79. Minutes of the Science Faculty, 1878-1902, June 22, 1878, p. 1.

80. Ibid., p. 2.

81. Ibid., October 7, 1878, p. 3.

82. Ibid., November 1, 1878, p. 4.

83. Minutes of the Board of Regents, Book B, March 14, 1879, p. 113.

84. State University of Iowa Catalogue, 1877-1878 pp. 47-52; Ibid., 1878-1879, p. 16-20.

85. Minutes of the Collegiate Faculty, 1860-1881, p. 556; State University of Iowa Catalogue, 1878-1879, p. 11.

86. Minutes of the Science Faculty, 1878-1902, pp. 29, 39.

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88. Report of the President to the Board of Regents, 1878.

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91. Ibid.

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   February 20, 1885.

95. William C. Lang, A History of the State University of Iowa:
The Collegiate Department From 1879-1900, p. 254.

96. Report of the President to the Board of Regents
   (University of Michigan) 1880, pp. 5-9.

97. The University Reporter, (Iowa City) Vol. XI,
   March 1879.

98. Minutes of the Board of Regents, Book B,

99. The Vidette Reporter, Vol. XXII June 18, 1890
   pp. 5-9.


101. Minutes of the School of Science Faculty, 1878-
     1902, February 24, 1885, p. 67; Minutes of the
     Board of Regents, Book B, March 3, 1885,
     p. 322.

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     1902, February 24, 1885, p. 67.

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     Board of Regents, Book B, March 3, 1885, p. 322.

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     3, 1886, p. 323.

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     1902, February 27, 1885, pp. 71-72.

106. Ibid.
107. Minutes of the School of Letters Faculty, p. 60.


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110. Minutes of the Board of Regents, Book B, June 20, 1885, p. 333.

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116. Report of Professor Philbrick to President Pickard, June 5, 1879. MS.

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143. *Iowa City Weekly Republican*, Vol. XLII, March 5, 1884.


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149. Minutes of the Board of Regents, Book B, April 22, 1884, p. 275.

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153. Report of Professor Philbrick to President Pickard, June 1, 1881, Ms.


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157. Ibid., p. 233.


159. Ibid.

160. Minutes of the Board of Regents, Book B, June 20, 1885, p. 334.

161. Ibid., June 23, 1886, p. 373.

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165. Ibid., June 24, 1886, p. 380.

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168. Ibid.

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171. Professor Philbrick, Letter to the Board of Regents. Read at Board of Regents Meeting October 13, 1886. MS.

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173. Business: Secretary's Correspondence, 1886-1890, p. 13. MS.

William J. Haddock, Letter to Honorable J. F. Duncome, Fort Dodge, October 14, 1886.


175. Ibid., p. 8.

176. Report of President Pickard to the Board of Regents, November 23, 1886. MS.

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179. Report of President Pickard to the Board of Regents, November 23, 1886. MS.

181. Report of President Pickard to the Board of Regents, November 23, 1886. MS.

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184. Ibid., p. 413.

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190. Ibid., Professor Philbrick had previously given the Board a choice between accepting his resignation or removing William E. Crane.

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193. Ibid., March 2, 1887, p. 428.

194. Ibid., p. 429.

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196. Ibid.

197. Ibid.

198. Professor Philbrick, Letter to the Board of Regents, March 30, 1887, MS.


200. Ibid.


204. The Vidette Reporter, (Iowa City) Vol. XIX, March 5, 1887, p. 1.

205. Ibid.

206. Ibid.

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4. Honorable William Boyd, Chairman of the Iowa State Board of Education, Charles Ashmead Schaeffer, M.S.

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7. William J. Haddock, Letter to Professor Arthur Beardsley, Filed in Business: Secretary's Correspondence, p. 122. University Archives.


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11. Ibid.

12. Ibid.


17. Ibid.

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19. Ibid.


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26. The Vidette-Reporter, (Iowa City) Vol. XXII, June 18, 1890, p. 9. (an excellent article on Civil Engineering).


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33. Ibid.

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35. Ibid.

36. Ibid.
37. Ibid.
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39. Ibid.
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44. Report of Professor Jameson to President Schaeffer, October 11, 1889. MS.

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47. Ibid., p. 26.

48. Ibid., p. 27.

49. Ibid., p. 20.


52. Ibid., April 19, 1890, p. 1.

53. Laws of Iowa, 1890, p. 108.

54. The Des Moines Weekly Leader, April 17, 1890. Journal of the Senate, 1890.

55. Professor Jameson, Petition submitted to President Schaeffer to be Presented to the Board of Regents, April 25, 1890, MS.
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57. Minutes of the Board of Regents, Book B, April 25, 1890, p. 243.

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69. Ibid., pp. 11-12.

70. Ibid.; The Iowa State Press (Iowa City) Vol. XXXI, March 18, 1892; The Vidette-Reporter, Vol. XXIV, November 24, 1891.


75. Laws of Iowa, 1892, pp. 133-134.


78. Ibid., pp. 162, 178.

79. Journal of the Senate, 1892, p. 188; The Iowa State Press, (Iowa City), February 17, 1892.


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83. Report of the State University, "Report of the President", October 1, 1893, p. 32.


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88. Journal of the Senate, 1894, p. 25.


90. Laws of Iowa, 1894, p. 148.

91. The Des Moines Weekly Leader, March 29, 1894.

92. Minutes of the Board of Regents, Book B, April 25, 1894, p. 786; Minutes of the Executive Committee, 1893-1899, April 11, 1894, p. 64.
93. Letter to the Board of Regents, signed by Scientific Professors, Colvin, McBride, Nutting, Shimek and Houser, March 26, 1894. MS.

94. Charles Scott Magowan, op. cit., p. 29.

95. Minutes of the Board of Regents, Book A, April 26, 1894, p. 789.

96. Ibid.

97. Minutes of the Executive Committee, 1893-1899, December 26, 1894, p. 117.

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100. The Vidette-Reporter, (Iowa City), Vol. XVII, January 24, 1895, p. 2.

101. Ibid.

102. Laws of Iowa, 1904, p. 146.

103. The Vidette Reporter (Iowa City), Vol. XXIII, November 15, 1890, p. 4.

104. Ibid.

105. Ibid.


107. Ibid., Vol. XXIII, November 15, 1890, p. 4.


109. Ibid., Vol. XXIII, November 15, 1890, p. 4.

110. Minutes of the Executive Committee, 1893-1899, June 26, 1894, p. 78.


112. Ibid., p. 15.
113. Minutes of the Executive Committee, 1893-1899, June 26, 1894, p. 78. (Copies of the Circular are very rare. A copy is preserved in the University Archives and one in the Iowa Historical Library.)

114. State University of Iowa School of Applied Mechanics and Architecture, "Annual Announcement," 1894-1895, p. 3. (So far as known this was the only circular published.)

115. Ibid.


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118. Ibid., pp. 7-8.

119. Professor B. J. Lambert, student of engineering in 1898 does not recall the existence of the school; Curtis Day, a graduate of engineering, 1895 and assistant to Professor Jameson for a short time does not recall its establishment nor existence.


121. Statement, Professor B. J. Lambert, personal interview.

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126. Minutes of the Faculty, 1881-1889, November 15, 1890, p. 245.
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130. Minutes of the Faculty, 1881-1899, December 12, 1890, p. 247. (Committee Report is interleaved).

131. Ibid.


133. State University of Iowa Catalogue, 1890-91, p. 21.


135. Ibid.


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140. Ibid., p. 105.

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142. Ibid., pp. 105-106.

143. State University of Iowa Catalogue, 1888-89, p. 18.

144. Ibid.


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153. Iowa Homestead, (Des Moines) August 22, 1890.


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158. Minutes of the Board of Regents, Book C, June 12, 1895, p. 58.

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161. Report of Professor Sims to President Schaeffer, May 27, 1898, MS.

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163. Announcement of the Course in Civil Engineering, State University of Iowa, (Iowa City), 1896.
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   May 27, 1898. NS.

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   p. 15.
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3. Ibid.


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10. Minutes of the Faculty: Collegiate Department, 1899-1900, December 10, 1900, p. 45.

11. Report of the Science Committee to the Faculty of the College of Liberal Arts, December 10, 1900, MS. Filed as Report No. 163. Registrar's Office.

12. Minutes of the Board of Regents, Book C, December 21, 1900, p. 348.

13. Ibid., p. 349.

15. "Prospectus of Engineering at the State University of Iowa", The Transit, State University of Iowa, Vol. VIII, 1900, p. 68; Iowa City Republican, Vol. XXVIII, April 2, 1904.

16. The Des Moines Weekly Leader, March 14, 1901, p. 3.


18. The Des Moines Weekly Leader, March 14, 1901, p. 3.

19. Ibid.

20. "Prospectus of Engineering at the University of Iowa," The Transit, State University of Iowa, Vol. VIII, p. 68.


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31. *Minutes of the Faculty: Collegiate Department, 1899-1906, February 21, 1902, p. 84.*


33. *Report of the Committee on the Course of Study to the Faculty of the College of Liberal Arts, February 28, 1902. Filed as Report 197, Registrar's Office. MS.*


36. *Minutes of the Faculty: Collegiate Department, 1899-1906, March 27, 1902, p. 93.*


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40. *Minutes of the Board of Regents, Book C, April 25, 1902, p. 412.*


42. *Preambles adopted by the Science of the College of Liberal Arts, May 12, 1902, MS.*

43. *Minutes of the Board of Regents, Book C, June 12, 1902, p. 428.*

44. *Announcement of the School of Applied Science, The State University of Iowa, 1904-1905, pp. 32-33.*

45. *Minutes of the Board of Regents, Book C, July 22, 1902, p. 441.*
46. President MacLean, Letter to Mr. J. W. Downey, Fort Collins, Colorado, February 21, 1903.

47. Minutes of the Board of Regents, Book C, 1902-1905, April 9, 1903, p. 22.


49. Ibid.

50. Ibid., June 17, 1903, p. 73.

51. Ibid., pp. 72-73.


54. Ibid.

55. President George E. MacLean, Letter to Professor Frank A. Wilder, (University of North Dakota), May 2, 1903. M3.


57. Minutes of the Board of Regents, 1903-1905 June 17, 1903, p. 73; Iowa City Republican, Vol. XXVII, June 19, 1903.


59. Minutes of the Board of Regents, 1903-1905, September 24, 1903, p. 15.

60. Ibid.


63. Ibid., p. 16.

64. Laenas G. Weld, Letter to President MacLean, August 15, 1903. MS.

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68. Laenas G. Weld, Letter to President MacLean, August 15, 1903. MS.; Laenas G. Weld, Letter to Executive Committee, August 17, 1903. MS.


70. Laenas G. Weld, Letter to Executive Committee, August 17, 1903. MS.

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72. Ibid.

73. Laenas G. Weld, Letter to Mr. W. J. McChesney, (Iowa City), August 2, 1903. MS.

74. Laenas G. Weld, Letter to the Executive Committee, August 17, 1903. MS.

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78. William J. Haddock, op. cit., p. 53.

80. Ibid.

81. Ibid., p. 17.

82. Ibid.

83. Ibid.


86. Ibid.


90. Ibid.


97. Ibid., p. 1071.

98. Iowa City Republican, Vol. XXVIII, April 9, 1904, p. 5.


100. Ibid., p. 1189; Laws of Iowa, 1904, p. 146; Iowa City Republican, Vol. XXVIII, April 11, 1904.

101. Minutes of the Board of Regents, 1903-1905, June 15, 1904, p. 149.

102. W. J. McChesney, Letter to Leonas G. Weld, June 17, 1904, MS. Filed in "Correspondence of the Secretary," 1904, university Archives.

103. Record of President MacLean's Investigation, Conducted by the Board of Regents, June 14-16, 1904, MS. The Register and Leader, (Des Moines) June 15, 1904; Iowa City Republican, Vol. XXIX, June 14, 1904.

104. Iowa City Republican, Vol. XXIX, June 14, 1904, p. 5.

105. Ibid.

106. Record of President MacLean's Investigation, June 14-16, 1904, MS; Iowa City Republican, Vol. XIX, June 15, 1904, p. 5.

107. Record of President MacLean's Investigation, June 14-16, 1904 MS.

The names of the faculty members summoned to give testimony were: Deans Currier, Gregory, Hosford and Weld; Dr. Guthrie; Professors Sims, MacBridge, Andrews, Loas, Putten, Van Steederen, Wilcox, Shambaugh, Wilson, Testers, Plum, Seashore, and Shimek.

109. Information given by Professor Harry Plum. Department of History, State University of Iowa.

110. The Iowa Citizen (Iowa City) No. 63, June 17, 1904; The Register and Leader, (Des Moines) June 17, 1904. The Iowa Alumnus, (State University of Iowa), Vol. I, June 1904, p. 105.

111. Ibid.

112. Minutes of the Board of Regents, 1903-1905, June 16, 1904, pp. 157-158; Iowa City Republican, Vol. XIX, June 17, 1904, p. 5.

113. The Register and Leader, (Des Moines) No. 716, June 17, 1904.

114. Iowa City Republican, Vol. XIX, June 17, 1904, p. 5.

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117. The Iowa Citizen, (Iowa City) No. 63, June 17, 1904.

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121. Information, obtained from Professor B. J. Lambert and Dean Carl Seashore, State University of Iowa.

122. Minutes of the Board of Regents, 1903-1905, June 15, 1904, pp. 157-158.


126. Minutes of the Board of Regents, 1903-1905, September 22, 1904, p. 222.

127. Ibid.

Chapter V

FOOTNOTES


2. Ibid., p. 754; *Minutes of the State Board of Education*, 1912-1913, p. 74; *Journal of the House*, 1939, p. 159.


6. Ibid.


9. Ibid.


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19. The Register and Leader. (Des Moines) March 10, 1904.

20. Ibid.


23. Ibid.

24. The Register and Leader. (Des Moines) March 25, 1904.


27. Ibid.


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37. The Register and Leader, (Des Moines), March 23, 1904.

38. The Register and Leader, (Des Moines), March 26, 1904; The Iowa Citizen, (Iowa City), 14th year, March 28, 1904; The Daily Iowan Vol. III March 26, 1904.


44. Statement, Professor B. J. Lambert, personal interview.

45. The Daily Iowan, (Iowa City) Vol. III, March 29, 1904; The Iowa City, (Iowa City), March 30, 1904.


49. The Daily Iowan, (Iowa City), Vol. III, April 12, 1904.
50. *Iowa City Republican*, Vol. XXVIII, April 12, 1904.

51. *Iowa City Republican*, Vol. XXVIII, April 12, 1904; *The Daily Iowan*, (Iowa City), Vol. III, April 12, 1904; *The Iowa Citizen*, April 13, 1904.

52. *Iowa City Republican*, Vol. XXVIII, April 12, 1904.

53. Ibid.

54. Ibid.

55. *The Daily Iowan*, (Iowa City), Vol. III, April 12, 1904.


58. Ibid., 1906, p. 346.

59. Ibid.

60. Ibid., 1907, p. 165.

61. Ibid., 1906, p. 346.


64. Ibid., p. 1224; *Journal of the House*, 1909, pp. 1122-1123.


69. Ibid.
70. Ibid., p. 8.
71. Ibid.
74. Ibid., 1912, p. 8.
75. Ibid.
77. Minutes of the Iowa State Board of Education, 1912-1913, p. 57; Iowa City Republican, Vol. LXXII, October 8, 1912.
78. Iowa City Republican, Vol. LXXII, October 8, 1912.
80. Ibid.
81. Ibid.
82. Ibid., p. 74.
83. Iowa City Republican, Vol. LXXII, October 10, 1912.
84. The Daily Iowan, (Iowa City) Vol. XII, October 10, 1912.
85. Ibid.
86. The Iowa State Board of Education, 1912, (Des Moines) "Report to the Governor", p. 8.
87. Ibid.
88. Ibid.
89. Ibid., p. 9.
90. Ibid., p. 8.
91. W. D. Lovell, Letter to Dean Raymond, July 6, 1912, MS. Engineering Archives.

92. Ibid.


94. Ibid., July 11, 1912.

"One of these is the University of Indiana in which state engineering is concentrated at the College of Agriculture and Mechanic Arts, which is in fact and in name a University entailing much more duplication than we now have in Iowa. The other is the University of Chicago, the management of which has long wished to establish an engineering college, but has been unable to do so on a scale commensurate with the rest of the organization."

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96. Carl F. Kuehnle, (Denison, Iowa), Letter to Presi-Bowman, June 25, 1912, MS.

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99. Ibid.

100. William G. Raymond, Letter to W. D. Lovell, (Minneapolis, Minnesota) October 10, 1912. MS. Engineering Archives.

101. Iowa City Republican, Vol. LXXII, October 12, 1912.

102. The Daily Iowan, (Iowa City), Vol. XII, October 11, 1912.

103. Iowa City Republican, Vol. LXXII, October 11, 1912.

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105. Ibid., October 12, 1912; *Iowa City Republican*, Vol. LXXII, October 12, 1912.


107. Benjamin Boer, quoted in *The Daily Iowan* (Iowa City), Vol. XII, October 13, 1912.


110. *Iowa City Republican*, Vol. LXXII, October 12, 1912.

111. Ibid.

112. Ibid.

113. Ibid.

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116. Ibid., November 17, 1912; *Iowa City Republican*, Vol. LXXII, November 18, 1912.


118. Ibid.

119. Ibid., December 6, 1912. Excerpt from address by Professor George C. Whipple is quoted.

120. Ibid., October 12, 1912.

121. *The Daily Iowan* (Iowa City), Vol. XII, October 18, 1912.

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123. Ibid.
124. Ibid., October 31, 1912.

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126. Ibid.

127. Ibid.

128. Ibid., November 10, 1912.

129. Ibid.


131. Ibid., November 7, 1912.

132. The Daily Iowan. (Iowa City) Vol. XII November, 1912.

133. Ibid., October 31, 1912.

134. Iowa City Republican. Vol. LXXII, November 27, 1912. Quoted from the Davenport Democrat.

135. A Plain Statement of Facts, with regard to the Engineering Situation at the State University of Iowa, 1912. Published by the Students Central Committee of the State University of Iowa. The title on the cover of this bulletin and the one commonly referred to is "Shall Engineering be Removed from the University."

136. Ibid., pages of the bulletin are not numbered. It contains twenty two pages a number of which are given entirely to illustrations.

137. Ibid.

138. The Iowa State Board of Education. 1912, (Des Moines) "Report to the Governor", p. 8.

139. A Plain Statement of Facts, with regard to the Engineering Situation at the State University of Iowa. Published by the Students Central Committee.
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141. Ibid., December 14, 1912.

142. The Daily Iowan, (Iowa City), Vol. XII, November 12, 1912.

143. Ibid., December 5, 1912.

144. Ibid., December 12, 1912.

145. W. D. Lovell, Letter to Dean Raymond, July 6, 1912. MS. Engineering Archives; Dean Raymond, Letter to W. D. Lovell, July 8, 1912. MS. Engineering Archives.

146. Iowa City Republican, Vol. LXXII October 26, 1912.

147. W. D. Lovell, Letter to Irving E. Brant, Iowa City, October 12, 1912. MS. Engineering Archives.

148. Ibid. Dean Raymond, Letter to W. D. Lovell, Minneapolis, Minnesota, October 14, 1912. MS. Engineering Archives.

149. Dean Raymond, Letter to W. D. Lovell, Minneapolis, October 14, 1912. MS. Engineering Archives.

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153. Dean Raymond, Letter to W. D. Lovell, (Minneapolis), October 14, 1912. MS. Engineering Archives.

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156. W. D. Lovell, Letter to Irving E. Brant, (Iowa City), October 12, 1912. MS. Engineering Archives.
157. Dean Raymond, Letter to W. D. Lovell, (Minneapolis), October 14, 1912, MS. Engineering Archives.

158. Dean Raymond, Letter to George E. MacLean, (Washington, D. C.), November 25, 1912. MS. Engineering Archives.

159. Dean Raymond, Letter to Mr. W. D. Lovell, (Minneapolis), November 8, 1912. MS. Engineering Archives; The Daily Iowan, (Iowa City), Vol. XII, October 27, 1912.

160. Dean Raymond, Letter to Mr. W. D. Lovell, (Minneapolis), November 8, 1912. MS. Engineering Archives.

161. Ibid.


164. Dean Raymond, Letter to Mr. J. B. Weaver, (Des Moines), October 23, 1912. MS. Engineering Archives.

165. "Opinion of Hon. Frederick W. Lehmann" Iowa's Educational Problem, pp. 15-24. Published by the State University Alumni, 1912.

166. W. D. Lovell, (Minneapolis) Letter to Mr. W. O. Finkbine, (Des Moines) December 2, 1912. Copy of the letter sent to Dean Raymond, MS. Engineering Archives.


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171. Ibid.

172. The Daily Iowan, (Iowa City), Vol. XII, December 12, 1912.

173. Iowa City Republican, Vol. LXXII, December 6, 1912.

174. A. N. Hanson, Secretary of the Associated Students of Applied Science, Letter to the Engineering Alumni, November 30, 1912. MS, Engineering Archives.

175. Iowa's Educational Problem, a Discussion of the Problems Involved in the Recommendations of the Board, Together with an Opinion by Hon. Frederick W. Lehmann, of St. Louis, Late President American Bar Association, and Solicitor General of the United States, as to the Legality of the Board's Proposed Action. Alumni names appearing on the Bulletin were: James B. Weaver, Des Moines; George S. Wright, Council Bluffs; W. O. Finkbine, Des Moines; H. W. Seaman, Clinton; Arthur J. Cox, Iowa City; Carl F. Kuehnle, Denison, E. W. Weeks, Guthrie Center; Euclid Sanders, Iowa City.

176. Ibid.

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179. Ibid., pp. 54-55.

180. Dean Raymond, Letter to W. D. Lovell, (Minneapolis), January 24, 1913. MS, Engineering Archives.


182. Ibid.

183. Iowa City Republican, Vol. LXXII, October 23, 1912.

184. Ibid., November 30, 1912.

185. Ibid., January 18, 21, 1913.
186. Ibid., January 18, 1913.

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188. Dean Raymond, Letter to W. D. Lovell, (Minneapolis), January 24, 1913. MS. Engineering Archives.

189. Iowa City Republican, Vol. LXXII, January 21, 1913; The Daily Iowan, (Iowa City), Vol. XII, January 22, 1913.

190. Dean Raymond, Letter to W. D. Lovell, (Minneapolis), January 24, 1913. MS. Engineering Archives.


192. "Decision of Colorado Supreme Court" rendered 1897. Quoted in Iowa's Educational Problem, pp. 24-25; Iowa City Republican. Vol. LXXII, December 24, 1912.

193. Dean Raymond, Letter to James B. Weaver, (Des Moines), January 24, 1913. MS. Engineering Archives.

194. The Daily Iowan, (Iowa City) Vol. XII, January 21, 1913.

195. Ibid.


197. Ibid.

198. Ibid., Iowa City Republican, Vol. LXXII, January 30, 1913.

199. Iowa City Republican, Vol. LXXII, January 30, 1913.

200. Ibid., February 5, 1913.

201. The Register and Leader, (Des Moines) February 5, 1913; Iowa City Republican, Vol. LXXII, February 5, 1913.


203. Ibid.


207. Ibid., p. 312.


209. George E. MacLean, Quoted in, Iowa City Republican, Vol. LXXII, February 12, 1913.


213. Iowa City Republican, Vol. LXXII February 13, 1913.

214. Ibid.

215. Ibid.

216. Mr. James B. Weaver, Quoted in the Iowa City Republican, Vol. LXXII February 13, 1913.

217. Ibid.

218. Ibid.

219. Ibid.

220. Ibid.

221. The Daily Iowan, (Iowa City), Vol. XII, February 14, 1913.

222. Iowa City Republican, Vol. LXXII
223. Ibid.


226. Iowa City Republican, Vol. LXXII, February 18, 1913.


228. Ibid., p. 640; Iowa City Republican, Vol. LXXII, February 19, 1913.


230. Ibid., pp. 640-641.


233. Ibid.

234. Ibid., p. 642.

235. Ibid.

236. Iowa City Republican, Vol. LXXII, February 25, 1913.

237. Ibid., February 22, 1913.

238. Ibid., February 25, 1913.

239. Ibid.


241. Ibid., pp. 731-732.

242. Ibid., p. 732.
243. Ibid.

244. Ibid., p. 734.


246. Ibid.

247. Ibid.

248. Ibid.

249. Ibid.

250. Ibid.


252. Ibid., p. 816; *Iowa City Republican*, Vol. LXXII, February 26, 1913.


255. *Iowa City Republican*, Vol. LXXII, February 27, 1913.

256. Ibid., March 6, 1913.

257. Ibid., March 13, 1913.


259. Ibid.

260. Ibid.

261. Ibid.

262. Ibid.


265. Ibid.
266. Ibid., p. 1639.

267. Minutes of the Board of Education, 1912-1913. April 1913, p. 1639; Dean Raymond, Letter to George E. MacLean, April 5, 1913, MS. Engineering Archives; Iowa City Republican. Vol. LXXII, April 4, 1913.

268. George E. Mac Lean, (Washington, D.C.), Letter to Dean Raymond, April 7, 1913. MS. Engineering Archives.

269. George E. Mac Lean, (Washington, D.C.) Letter to Dean Raymond, April 5, 1913, MS. Engineering Archives.


271. Ibid.

Those appointed on the Committee were Representatives Peisen, Chairman; Goode, Burma, Van Costerhaut, Kuester, Foster and Groham.

272. Journal of the Senate, 1913, p. 11. Those appointed to the Committee were Senators Forsling, chairman; Donahue, Evans, Corwin, Hill, Bekman, and Gillette.


276. Des Moines Register, Vol. XC, January 29, 1939. The statement was made by Lieutenant-Governor Hickenlooper in an address to the Des Moines Chamber of Commerce, January 27, 1939.

277. Iowa City Press-Citizen, January 26, 1939.


282. Statement, Dean Francis M. Dawson, personal interview.


287. Ibid.


292. Iowa City Press-Citizen. February 1, 1939.

293. Statement, Dean Francis M. Dawson, personal interview.


295. Historical Financial and Statistical Facts Concerning the College of Engineering at State University of Iowa, January 1939.


297. Historical Financial and Statistical Facts Concerning the College of Engineering at the State University of Iowa, January 1939.

298. Ibid.


301. Statement, Dean Francis M. Dawson, personal interview.


303. Ibid., February 3, 1931.


305. Ibid.


308. Ibid.

309. Ibid., February 16, 1939.

Chapter VI

FOOTNOTES


2. Ibid.


5. Ibid.


8. Minutes of the Board of Regents, 1903-1905, September 22, 1904.


10. Ibid.


12. Ibid.

13. Ibid.


15. Ibid.

16. Ibid.
The companies submitting bids were:
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W. G. Birdsall, Ferry, Iowa
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