"SCIENCE WITH PRACTICE"
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CALENDAR FOR 1904-1905

1904.

Easter Vacation, ......................... March 30 to April 4.
Baccalaureate Address, ...................... Sun., June 5.
Annual Alumni Meetings, ........ Tues.-Wed., June 7 and 8.
Commencement, ............................ Wed., June 8.

1904-5.

First term of College year begins, ................ Thur., Sept. 1.
Recitations begin, ......................... Mon., Sept. 5
Thanksgiving Vacation, ...................... Nov., 23 to 28.
Term Examination, ......................... Dec. 21-22.
OFFICERS OF THE COLLEGE
BOARD OF TRUSTEES

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HON. J. B. HUNGERFORD, Carroll..........................Chairman
E. W. STANTON, Ames...........................................Secretary
HERMAN KNAPP, Ames...........................................Treasurer
W. A. HELSELL, Odebolt.........................................Financial Secretary
J. F. CAVELL, Ames...............................................Custodian

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Ex-officio—HON. ALBERT B. CUMMINS, Governor of Iowa.
Ex-officio—HON. JOHN F. RIGGS, Superintendent of Public Instruction.

Term Expires
First District—HON. S. H. WATKINS, Libertyville...........1904
Second District—HON. C. S. BARCLAY, West Liberty.........1904
Third District—HON. E. A. ALEXANDER, Clarion...............1908
Fourth District—HON. C. L. GABRIILSEN, New Hampton......1904
Fifth District—HON. W. R. MONINGER, Marshalltown.........1906
Sixth District—HON. W. O. McELROY, Newton................1908
Seventh District—HON. W. K. BOARDMAN, Nevada...............1906
Eighth District—HON. W. B. PENICK, Charlton...............1904
Ninth District—HON. JAMES H. WILSON, Adair...............1908
Tenth District—HON. J. B. HUNGERFORD, Carroll............1906
Eleventh District—HON. W. J. DIXON, Sac City.............1906

STANDING COMMITTEES.

GROUP I.

Building Committee: Trustees Dixon, Hungerford, Boardman; additional members, Watkins, Gabrilson.

GROUP II.

Committee on Agriculture, Horticulture, Experiment Station and Veterinary Science: Trustees Barclay, Boardman, Moninger, Wilson, Gov. Cummins.
Committee on Engineering Departments and Physics: Trustees Gabrilson, Riggs, McElroy, Hungerford, Dixon.
Committee on College Hospital and Sanitary Arrangements: Trustees Watkins, Moninger, Penick.

GROUP III.

Committee on Faculty and Courses of Study: Trustees McElroy, Riggs, Hungerford, Gabrilsen, Alexander, Dixon.
Committee on College Lands and Investments: Trustees Penick, Moninger, Gov. Cummins.
Committee on Rules: Trustees Wilson, Boardman, Alexander.

GROUP IV.

Committee on Scientific Departments: Trustees Alexander, Gabrilsen, Riggs, McElroy, Watkins.
Committee on Literary Departments and Library: Trustees Wilson, Boardman, Riggs, Alexander, Penick.
Committee on Public Grounds and Assignment of Rooms: Trustees Hungerford, Alexander, Barclay.
Committee on Bonds: Trustees Moninger, Wilson.

MEETINGS.

The annual meeting of the Board of Trustees is held in July. Other meetings are held as may be necessary.
BOARD OF TRUSTEES

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E. W. Stanton, Ames..................................Secretary
Herman Knapp, Ames..................................Treasurer
W. A. Helsell, Odebolt..............................Financial Secretary
J. F. Cavell, Ames..................................Custodian

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Ex-officio—Hon. Albert B. Cummins; Governor of Iowa.
Ex-officio—Hon. John F. Riggs, Superintendent of Public Instruction.

Term Expires
First District—Hon. S. H. Watkins, Libertyville............1904
Second District—Hon. C. S. Barclay, West Liberty............1904
Third District—Hon. E. A. Alexander, Clarion............1908
Fourth District—Hon. C. L. Gabrielsen, New Hampton............1904
Fifth District—Hon. W. R. Moninger, Marshalltown............1906
Sixth District—Hon. W. O. McElroy, Newton............1908
Seventh District—Hon. W. K. Boardman, Nevada............1906
Eighth District—Hon. W. B. Penick, Chariton............1904
Ninth District—Hon. James H. Wilson, Adair............1908
Tenth District—Hon. J. B. Hungerford, Carroll............1906
Eleventh District—Hon. W. J. Dixon, Sac City............1906

STANDING COMMITTEES

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GROUP II.

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Committee on Engineering Departments and Physics: Trustees Gabrielsen, Riggs, McElroy, Hungerford, Dixon.
Committee on College Hospital and Sanitary Arrangements: Trustees Watkins, Moninger, Penick.

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MEETINGS.

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President.

M. STALKER, M. Sc., V. S.,
Lecturer on Veterinary Medicine.

J. L. BUDD, M. H.,
Professor Emeritus in Horticulture.

EDGAR WILLIAM STANTON, M. Sc.,
Dean of the Junior College and Professor of Mathematics
and Economic Science.

GEN. JAMES RUSH LINCOLN,
Professor of Military Science.

ALFRED ALLEN BENNETT, M. Sc.,
Professor of Chemistry.

LOUIS HERMANN PAMMEL, B. Ag., M. S., Ph. D.,
Professor of Botany.

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Lecturer in Agriculture.

GEORGE WELTON BISSELL, M. E.,
Professor of Mechanical Engineering.

ANSON MARSTON, C. E.,
Professor of Civil Engineering and Dean of the School of Engineering.

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Professor of Agricultural Chemistry.

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Dean of Agriculture and Director of Experiment Station.

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Professor of Zoology.

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Professor of Public Speaking.

GEORGE LEWIS McKAY,
Professor of Dairying.

ORANGE HOWARD CESSNA, A. M., D. D.,
Professor of History and Psychology.

JOHN H. McNEALL, V. M. D.,
Dean of Veterinary Science and Professor of Anatomy and Principles and Practice of Surgery.

WILLARD JOHN KENNEDY, B. S. A.,
Professor of Animal Husbandry and Vice Director of the Experiment Station.

CARL WARREN GAY, D. V. M.,
Professor of Pathology and Histology.

PERRY GREELEY HOLDEN, M. Sc., B. Pd.,
Professor of Agronomy and Vice Dean.

WILLIAM HENRY STEVENSON, A. B.,
Professor of Soils.

M. JACOB, V. M. D.,
Professor of Veterinary Medicine and Sanitary Science.

CLARENCE JANNE ZINTHEO, B. S.,
Professor of Farm Mechanics.

WARREN H. MEEKER, M. E.,
Associate Professor of Mechanical Engineering.

**MISS GEORGETTA WITTER, B. L.,
Professor of Domestic Economy.

**RICHARD C. BARRETT, M. A.,
Professor of Civics.

ARTHUR THOMAS ERWIN, M. S. A.,
Acting Professor of Horticulture.

BURTON SMITH LANPHEAR, M. M. E.,
Assistant Professor of Electrical Engineering.

LEWIS EUGENE ASHBAUGH, B. S., Ph. B.,
Assistant Professor of Civil Engineering.

*MISS ELMINA T. WILSON, C. E.,
Assistant Professor of Civil Engineering.

*Granted one year's leave of absence.
**To take charge of Department, Sept. 1, 1904.
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MISS MARIA M. ROBERTS, B. L.,
Assistant Professor of Mathematics.

HERBERT WILLIAM DOW, B. S. IN M. E.,
Assistant Professor of Mechanical Engineering.

WALTER A. STUHR, D. V. M.,
Assistant Professor of Physiology and Therapeutics.

WILLIAM JOHN RUTHERFORD, B. S. A.,
Assistant Professor of Animal Husbandry

MISS LOLA ANN PLACEWAY, B. Sc.,
Assistant Professor of Chemistry

MISS BESSIE B. LARRABEE, A. B.,
Assistant Professor of English.

MISS ELIZABETH MACLEAN, M. DI.,
Assistant Professor of English.

WALTER HERBERT OLIN, M. Sc.,
Assistant Professor of Farm Crops.

EDWARD EVERETT BUGBEE, E. M.,
Assistant Professor of Mining Engineering.

FRANK FRENCH
Acting Assistant Professor of Civil Engineering.

FRANK JORDAN RESLER, B. Ph.,
Director of Music, Vocalist.

WILBERT EUGENE HARRIMAN, B. Sc., M. D.,
College Physician.

MRS. MARIAN H. KILBOURNE, B. L.,
Dean of Women.

EZRA CORNELIUS POTTER,
Instructor in Pattern Shop.

MRS. MARY ELIZABETH RESLER, B. Ph.,
Instructor in Instrumental Music.

*IRA ABRAHAM WILLIAMS, B. Sc.,
Instructor in Geology and Mining Engineering.

ERNEST ALANSON PATTENGILL, B. S.,
Instructor in Mathematics.

ELBERT BARRETT TUTTLE, B. S. IN E. E.,
Instructor in Physics.

*Granted leave of absence.
MISS JULIA COLPITTS, M. A.,
Instructor in Mathematics.

MISS HELEN GERTRUDE REED, Ph. B.,
Instructor in English.

MISS GRACE ISABEL NORTON, B. A.,
Instructor in German.

FRANK WILLIAM BOUSKA, M. Sc. A.,
Instructor in Dairy Bacteriology.

*MISS ADA J. MILLER, Ph. B.,
Instructor in English.

*WILBUR M. WILSON, B. M. E.,
Instructor in Mechanical Engineering

JOSEPH E. GUTHRIE, M. Sc.,
Instructor in Zoology.

MISS SARAH CAROLINE HOOK, B. L.,
Instructor in Public Speaking and Physical Culture for Women.

CHESTER MURRAY PERRIN, B. Sc.,
Instructor in History.

BENJAMIN H. HIBBARD, B. Ag., Ph. D.,
Instructor in Economic Science.

FRANK WENNER, B. S.,
Instructor in Physics.

MISS BERYL A. HOYT, A. B.,
Instructor in English.

MISS FRANCES MARIETTA WILLIAMS,
Instructor in Domestic Art.

MRS. ALICE PARKS, B. Sc.,
Instructor in Domestic Science, in Charge of Department.

MISS ANNIE W. FLEMING, B. Sc.,
Instructor in Mathematics.

MISS MAE MILLER, B. Sc.,
Instructor in History

MARK PERKINS CLEGHORN, B. Sc. in E. E.,
Instructor in Mechanical Engineering.

JOHN EDGAR STEWART, B. C. E.,
Instructor in Civil Engineering.

*Granted leave of absence.
MISS FANNIE ORA EDGETT, B. Sc.,
Instructor in Chemistry.

CHRISTIAN LARSEN, B. S. A.,
Instructor in Dairying.

WARD MURRAY JONES, B. C. E.,
Instructor in Mathematics.

H. R. WATKINS, B. S. A.,
Instructor in Chemistry.

CLARENCE ROY McKinney, B. Sc.,
Instructor in Chemistry.

JOSEPH ALBERT KNESCHE,
Instructor in Forge and Foundry

WAYNE DINSMORE,
Instructor in Animal Husbandry.

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Instructor in Machine Shop Practice.

RAY HARRISON HADFIELD, B. S. IN M. E.,
Instructor in Mechanical Drawing.

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Instructor in Mining Engineering.

JOHN STARR COYE., B. Sc.,
Instructor in Chemistry.

MISS HARRIETTE KELLOGG, A. M.,
Instructor in Botany.

MISS FLORENCE ANN LUCAS,
Instructor in French

MISS EFFIE ALENE WHITE, A. B.,
Instructor in English.

MISS ROSE ABEL, A. B.,
Instructor in English.

MISS RUTH MORRISON, A. B.,
Instructor in Domestic Economy.

JOHN F. TRAVIS, A. M.,
Instructor in Mathematics.

EDWARD ELIAS LITTLE, M. S. A.,
Assistant in Horticulture.

GEORGE IRVING CHRISTIE, B. S. A.,
Assistant in Soils.
WILLIAM WESLEY SMITH, B. S. A.,
Assistant in Animal Husbandry.

MATHEW LEANDER KING,
Assistant in Pattern Shop.

MELVIN LEROY MERRITT,
Assistant in Horticulture.

HARVA R. OTIS,
Assistant in Machine-Work.

JOHN ALEXANDER CONOVER, B. S. A.,
Graduate Assistant in Animal Husbandry.

JOHN HENRY LAWTON,
Assistant in Mechanical Drawing.

DAILY M. CURL,
Assistant in Forge and Foundry.

MRS. MARY LOUISE VANZILE,
Assistant in Domestic Science.

DAVID MAXWELL FYFFE,
Farm Superintendent.

JULIUS ERDMANN,
Gardener.

MISS VINA ELETHE CLARK,
Librarian.

MISS OLIVE STEVENS,
Assistant Librarian.
EXPERIMENT STATION STAFF

A. B. STORMS, A. M., D. D.,
President.

C. F. CURTISS, M. S. A.,
Director.

W. J. KENNEDY, B. S. A.,
Animal Husbandry and Vice Director.

A. T. ERWIN, M. S. A.,
Acting Horticulturist.

J. B. WEEMS, Ph. D.,
Chemist.

L H. PAMMEL, B. Ag., M. Sc., Ph. D.,
Botanist.

H. E. SUMMERS, B. S.,
Entomologist.

C. W. GAY, V. M. D.,
Veterinarian.

G. L. McKay,
Dairying.

P. G. HOLDEN, M. Sc., B. Pd.,
Agronomy.

C. J. ZINTHEO, B. Sc.,
Agricultural Engineer.

W. H. STEVENSON, A. B.,
Soils.

W. J. RUTHERFORD, B. S. A.,
Assistant in Animal Husbandry.

E. E. LITTLE, M. S. A.,
Assistant in Horticulture.

W. H. OLIN, M. Sc.,
Assistant in Agronomy.

T. S. HUNT, B. S. A.,
Assistant in Agronomy.

F. W. BOUSKA, B. S. A.,
Assistant in Dairying.

C. LARSEN, B. S. A.,
Assistant in Dairying.

R. E. BUCHANAN,
Assistant in Botany.

C. E. ELLIS,
Assistant Chemist.

CHARLOTTE M. KING,
Artist.
HISTORICAL

LOCATION

BUILDINGS, GROUNDS AND EQUIPMENTS
In 1858 the Legislature of Iowa passed an act to establish "A State Agricultural College and Model Farm," to be connected with the entire agricultural interests of the State; appointed a board of commissioners to buy a farm and erect a college building, and elected a board of trustees to select a faculty and organize a college. In 1859 a farm of six hundred and forty acres, situated near Ames, was purchased for the use of the college. The farm now contains eight hundred and forty acres.

In 1862 a bill was passed by Congress, entitled, "An act donating public lands to the several States and Territories, which may provide colleges for the benefit of Agriculture and the Mechanic Arts."

Section 1 of this act provides that for the support of such colleges there be granted "an amount of public land, to be apportioned to each State in quantity to equal thirty thousand acres for each Senator and Representative in Congress to which the States are respectively entitled by the apportionment under the census of 1860; provided that no mineral lands shall be selected or purchased under the provisions of this act."

Section 4 requires: "That all moneys derived from the sale of lands aforesaid by the States to which lands are apportioned, and from the sale of land script, hereinbefore provided for, shall constitute a perpetual fund, the capital of which shall remain forever undiminished (except as may be provided for in section fifth of this act), and the interest of which shall inviolably be apportioned by each State which may take and claim the benefit of this act, to the endowment, support and maintenance of at least one college, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the Legislature of the State may provide, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

Section 5 says: "And be it further enacted, that the grant of land and land script hereby authorized, shall be made on the following conditions, to which, as well as the provisions herein-
before contained, the previous assent of the several States shall be signified by legislative acts; first, if any portion of the fund, invested as provided by the foregoing section, or any portion of the interest thereon, shall, by any action or contingency, be diminished or lost, it shall be replaced by the State to which it belongs, so that the capital of the fund shall remain forever undiminished; and the annual interest shall be regularly applied without diminution to the purposes mentioned in the fourth section of this act, except that a sum not exceeding ten per centum upon the amount received by any State under the provisions of this act, may be expended for the purchase of land for sites or experimental farms, wherever authorized by the respective Legislatures of said States. Second, no portion of said fund nor the interest thereon shall be applied, directly or indirectly, under any pretense whatever, to the purchase, erection, preservation or repair of any building or buildings."

The General Assembly of Iowa, September 11, 1862, accepted the grant upon the conditions and under the restrictions contained in the act of Congress, and by so doing entered into contract with the General Government to erect and keep in repair all buildings necessary for the use of the College. By this action of the General Assembly the College was changed from an agricultural institution into a College of Agriculture and Mechanic Arts, with the broad and liberal course of study outlined in the following paragraph.

In 1882 the General Assembly passed an act defining the course of study to be pursued as follows: Section 1. That section 1621 of the Code is hereby repealed and the following is enacted in lieu thereof: "Section 1621. There shall be adopted and taught in the State Agricultural College, a broad, liberal and practical course of study, in which the leading branches of learning shall relate to agriculture and the mechanic arts, and which shall also embrace such other branches of learning as will most practically and liberally educate the agricultural and industrial classes in the several pursuits and professions of life, including military tactics. Section 2. That all acts, and parts of acts inconsistent with this act are hereby repealed."

August 30th the following act was approved by President Harrison: "Be it enacted by the Senate and House of Representatives of the United States in Congress assembled, that there shall be and hereby is, annually appropriated, out of any moneys in the treasury not otherwise appropriated, arising from the sales
of public lands, to be paid as hereinafter provided, to each State and Territory for the more complete endowment and maintenance of colleges for the benefit of agriculture and the mechanic arts now established, or which may hereafter be established, in accordance with an act of Congress approved July second, eighteen hundred and sixty-two, the sum of fifteen thousand dollars for the year ending June thirtieth, eighteen hundred and ninety, and an annual increase of the amount of such appropriation thereafter for ten years by an additional sum of one thousand dollars over the preceding year, and the annual amount to be paid thereafter to each State and Territory shall be twenty-five thousand dollars, to be applied only to instruction in agriculture, the mechanic arts, the English language and the various branches of mathematical, physical, natural and economic science, with special reference to their application in the industries of life, and to facilities for such instruction."

The income of the College from National grants is therefore expended in instruction, experimentation and illustration in agriculture and in the mechanic arts, and in underlying and related science and literature.

All buildings are erected and all repairs thereon are made by the State of Iowa, the cost down to date being about $750,000.

The College was formally opened on the 17th of March, 1869.
The College occupies a delightful and healthful location upon high rolling land, just west of Ames, Story County. The railroad facilities for reaching Ames from every part of the State are excellent. It is at the junction of the Des Moines and the northwestern branches and the main line of the Chicago & Northwestern R. R. The main line of the Chicago, Milwaukee & St. Paul intersects the Northwestern at Slater, eleven miles south, and the through line of the same system at Algona on the north. The main line of the Illinois Central intersects the Chicago & Northwestern at Webster City, just north, and the main line of the Iowa Central makes good connections at Marshalltown on the east. All the railway connections of Des Moines have thirty-seven miles to Ames. The Chicago & Northwestern Railway has frequent trains, Des Moines to Ames and return. A steam motor railway connects Ames and the College with efficient service. Ames is a most desirable town for wholesome college influences. Its people are enterprising, thrifty and cordial. The town has an excellent system of public schools, numerous churches, water works, electric lights, and a good city government. It affords wholesome surroundings for the students. It is an inviting community for families who wish to educate their children, enjoy the better elements of society and an environment of reasonable expenses. The town and the College are on very cordial terms, and its citizens take marked pains in the efforts of the students and the highest interests of the College. It is a model location for factories and business enterprises.
BUILDINGS, GROUNDS AND EQUIPMENTS

BUILDINGS.

Twenty-two commodious buildings have been erected by the State, for the exclusive use of the various departments of the College, besides the dwelling houses and buildings for farm stock, machinery and work.

All these buildings are heated by steam and lighted by electricity. Pure water is supplied to all of the buildings.

There are two rooming cottages, brick buildings, affording rooms for ninety-four students.

The other buildings are as follows, used for recitation and lecture rooms and laboratories:

*Chemical Hall:* Brick, three stories throughout; steam heat; water and gas. Laboratory outfit complete for 100 students in Chemistry.

*Veterinary Hospital:* Brick, three stories, containing offices, dissecting rooms, and all modern appliances for the treatment of diseased animals.

*Sanitary Hall:* Frame, two stories; lower floor, office, kitchen and dining room for the hospital patients and rooms for convalescents; upper floor, seven rooms for care of sick among the students.

*Engineering Laboratory:* Brick, four stories, including basement, and large “L,” containing machine shops, and the engineering laboratory, for the departments of Mechanical and Civil Engineering.

*The Wood Shop:* Brick, containing carpenter and pattern shops, with power and hand tools complete for wood work, and outfit of tools for individual work.

*Forge Shop and Foundry:* Brick, containing complete equipment for forging and moulding.

*Engineering hall:* The Engineering Departments occupy the new Engineering Hall. This is a fire-proof building in which all the engineering departments have offices, recitation and lecture rooms, laboratories and engineering museum. This build-
ing is of Bedford stone, has plate glass windows, and modern conveniences and furnishings throughout. It is the best engineering building at present west of the Mississippi river.

**Power House:** Brick, one story, contains engine and boiler, furnishing power for the shops, and accommodates experimental work of the course in Mechanical Engineering. The dynamos and motor power for electric engineering are now in this building, also the deep well pump.

**Locomotive Laboratory:** This building contains an eight-wheel locomotive and tender presented by the Chicago & Northwestern Railway Company.

**Music Hall:** Brick, two stories, fitted up with apparatus and instruments for practice and instruction.

**The Administrative Building:** Brick, for the use of trustees and faculty, and for offices of the president, secretary and treasurer.

**Dwelling Houses:** Eighteen comfortable dwelling houses on the grounds are occupied by professors’ families, and several others by foremen and employees.

**Morrill Hall** is named in honor of Hon. Justin S. Morrill, the originator of the “Land Grant” for Colleges of Agriculture and Mechanic Arts. The building cost about $35,000, including water supply, steam heat and electric light. It is of deep red brick, with stone foundation, and stone, brick and terra cotta trimmings interblended.

It stands on the high ground of the beautiful campus, north of and near the main building. It is for Chapel, capacity, 650; Library, containing 16,000 volumes; the Museum, Lecture Rooms and Laboratories of the Department of Zoology.

**Agricultural Hall** is a four-story building. The lower stories are composed of stone from the State quarries at Anamosa, and the upper stories are brick. It contains rooms for Horticulture, Agriculture, Agricultural Chemistry, Experiment Station work and Veterinary Medicine. It is finely lighted and heated and contains modern improvements.

**Greenhouses:** The present plant, including recent additions, contains 10,000 square feet under glass. The houses are of cypress construction throughout with an interior supporting structure of steel. They are heated by steam, operated on the Paul system, with varying temperatures for the propagating house, growing houses, and seed testing rooms. Adjoining the
IOWA STATE COLLEGE

Greenhouses are four commodious work rooms, with benches for potting, transplanting, and general greenhouse handicraft operations.

The Horticultural Laboratory is a building 35x50 feet, two stories with basement. It is connected with the greenhouse. The main room contains desk room and lockers for 25 students. Adjoining is a pomology room with bench room for 25 students to work in the study of fruits. The building is provided with two refrigerators, one for experimental work in cold storage and the other for storing fruits for class purposes. The second floor is provided with horticultural museum and facilities for photography.

Horse Barn and Stock Pavilion: The barn, composed of brick with slate roof, is for horses, the storage of grain and general farm purposes. One of the best stock pavilions in the country accommodating several hundred students at a time, is located near this barn and gives first class advantages for stock judging and animal husbandry. It is circular in form, well heated and lighted.

Station Barn: The Experiment Station barn is one of the best and most modern buildings of its kind to be found anywhere in the world. It is 50 feet wide, 100 feet long and has a round silo, 18 feet in diameter, on the northwest corner. It is veneered with buff pressed brick, has a slate roof and built in every way to provide for protection against fire.

The lower story is devoted to live stock and is conveniently arranged for the housing of beef cattle, dairy cattle and horses. The floors are of paved brick. The second story is used for the storage of vehicles, machinery, storage and grinding room for feed, and a complete set of seed rooms used by the Agronomy Section for the drying of corn and the storage of the different kinds of grain and feed stuffs used in experimental work. The third story is used as a storage room for hay and other coarse feed stuffs. The building has an electric motor, a complete water system and is lighted by electricity.

Judging Pavilion: In connection with the Experiment Station barn is a two-story octagonal judging pavilion. It is 65 feet in diameter, built of buff pressed brick with a slate roof. The lower story is used for stock judging and has every available convenience which would add to the comfort of the students and the effectiveness of the work—such as good light, comfortable seats, good ventilation and ample means of supplying warmth.
The second story is used for the study of grain judging. It also is well equipped in every way. This building is conceded to be the most complete structure of its kind to be found anywhere on the continent.

The Farm Mechanics Building: This building has been erected for the newly created department of Farm Mechanics. The building is 60x100 feet, four stories high, having two main floors and two balconies. Being built out of steel and pressed brick, it is entirely fire-proof. The cost of the building with equipment, is about $70,000.00 and it is no doubt the best building ever constructed for the teaching of Farm Mechanics.

On the lower floor are private workshops for the construction and repair of implements on the college farm, also tool rooms in which all the tools and instruments of the department are kept. The blacksmith shop and a room for the study and care of traction engines and other farm motors are also located on the lower floor. On the balcony above is located the carpenter shop.

On the second floor are the offices and class rooms of the professor in charge of the department. Also a drafting room and a students' reading room. A large machine operating room on this floor is devoted to the erection, care, and testing of the various kinds of farm implements such as binders, mowers, rakes, corn huskers and shredders, plows, harrows, etc.

The second balcony is devoted to experiments with corn planters and for exhibitions of various kinds of small farm tools. On this floor are also located bulletin rooms, a photographic department and offices for the assistants in the department as well as office room for the Iowa Agriculturist.

An electric elevator is installed in the building.

Other Buildings: Creamery, stables, barns, sheep and swine houses, seed houses, etc., sufficient for the requirements of the farm, are conveniently grouped near the College Campus.

MARGARET HALL.

A commodious and inviting building has been opened for the young women in the College. It is well designed for its purpose, built of brick, roofed with slate and is architecturally pleasing. It occupies one of the most sightly locations on the campus, giving the most pleasing outlook to its occupants. It is provided with steam heat, electric lights, ample parlors, bath rooms and the most improved modern conveniences. It is neatly and tastefully
furnished throughout. The Department of Domestic Economy also is located in the building and open to all young women of the College. Rooms will be assigned to new students in the order of their application. The young women are under the direction of an efficient dean of women.

THE COLLEGE GROUNDS.

The College domain includes about 840 acres. Of this about 125 acres are set apart for college grounds. These occupy the high land of the southwest part of the farm, and include the campus, shrubbery, plantations, young forestry plantations, the flower borders and gardens, with the beginnings of a botanical garden, and the surroundings of the professors' dwellings. Gravel drives, cement and gravel walks, lead to all parts of the grounds and to the various buildings, and the true principles of landscape gardening have been so faithfully observed in the gardening and in the location of buildings and drives as to make of the entire Campus a large and beautiful park. The view of the surrounding country from the upper stories of the large buildings is one of wide extent and great beauty.
DIRECTIONS TO CANDIDATES AND STUDENTS

REQUIREMENTS FOR ADMISSION.

CLASSIFICATION AND GRADING.

UNDERGRADUATE COURSES OF STUDY AND DEGREES

POST-GRADUATE COURSES OF STUDY AND ADVANCED DEGREES.
ENTRANCE REQUIREMENTS

ADMISSION TO ACADEMIC YEAR.

YEAR BEGINS SEPTEMBER 1, 1904.

Candidates for admission to the first term of the Academic Year will be required to present satisfactory evidence of proficiency in geography, arithmetic, United States history, human physiology, algebra to simple equations, orthography, reading and grammar. They will also be required to present further satisfactory evidence of efficient preparation such as will enable them successfully to enter the Freshman Year on completion of the year of Academic work. When an examination in grammar is required it will cover the following subjects: The eight parts of speech, the classification of nouns, pronouns, adjectives, and adverbs, the declension of nouns and pronouns, the comparison of adjectives and adverbs, and the rules of spelling that apply in grammatical inflection. For further information see sample examination questions in Preparatory Grammar, page 33. Examinations will be held on the first and second days of the school year.

ADMISSION TO SECOND TERM OF ACADEMIC YEAR.

TERM BEGINS JANUARY 19, 1905.

Students seeking admission to the second term of the Academic Year will need to meet the requirements for admission to the first term and in addition thereto, pass a satisfactory examination in the studies of that term. In lieu of examinations in history and drawing, standings of approved high schools will be accepted. No student assigned to the algebra of the first term will be allowed to take plane geometry. Graduates of schools included in either list of "Accredited Schools" will be accepted on trial without examination.

The examination in algebra will include addition, subtraction, multiplication, division, factoring, highest common factor, lowest common multiple, fractions, simple equations containing one or
more unknown quantities, problems involving equations of the first degree, and the discussion of such equations. The work in algebra should be of a grade equal to that of Wentworth's New School or Well's Essentials of Algebra.

The examination in English will cover the entire field of grammar, except prosody. In this examination much will depend on the candidate's ability to analyze a passage of good modern prose, and to punctuate his paper correctly. In analyzing he should be prepared to treat phrases and clauses as units, and to state the exact function of conjunctive words. He should show a ready and accurate knowledge of the structure of the prose sentence and the relations of its various parts to one another. For further information, see the sample examination questions in Advanced Grammar, page 33.

Many students will find it exceedingly desirable to begin their work in college in this term. Those who have had considerable algebra in the preparatory school should review its fundamental principles and become acquainted with their application in the wider and more difficult field of college work, and those who have had experience in plane geometry can to advantage supplement such study by a review of some standard text and a thorough drill in the original geometric propositions. The classes in these studies established at the beginning of the spring term furnish an excellent opportunity for students to prepare themselves thoroughly for entering upon collegiate work at the opening of the next school year.

In like manner, students who have completed grammar and have had a high school course in rhetoric have an opportunity in this term to review the principles of style and correct whatever errors they still make in expressing their thoughts. Without a thorough grounding in the principles of style and a considerable degree of accuracy in choosing words and constructing sentences, also in planning and developing paragraphs, it is practically impossible for a student to do creditable work in Freshman English. The majority of those who fail in English, fail because they are not fully prepared. In many instances the cause of failure is that the student has not been trained to apply the principles he has recited; properly directed practice in composition is far more important than the mere memorizing of rules and definitions. To begin work in this term would prepare many for a better standing throughout their course than would otherwise be possible.
REQUIREMENTS FOR ADMISSION TO FRESHMAN YEAR.

YEAR BEGINS SEPTEMBER 1, 1904.

The requirements for admission to the Veterinary course are fully specified in the write-up of the Veterinary Course.

The requirements for all courses other than Veterinary Science include either graduation from a High School belonging to the list of accredited schools prepared by the Committee on College Entrance Requirements appointed by the State Teachers' Association, or else approved standings in the studies of the Academic Year and the studies necessary for entrance to the Academic Year.

For all Engineering Courses, beginning with the fall term 1904, all students will be required to present one year's work in either French or German. This may consist of either one full High School year of five recitations per week or the course in French or German given in the Academic Year. Students who are not able to meet the entrance requirement in French or German, and who are otherwise satisfactorily prepared to enter the college, may be conditioned in this subject and make it up after entering college.

ENTRANCE REQUIREMENTS IN MATHEMATICS.

The examination in plane geometry will be upon the text used by the student. He should be prepared to demonstrate original exercises.

The examination in algebra will cover the following subjects: Fundamental operations, including examples involving the use of literal, fractional and negative exponents; parentheses occurring in terms and factors; factoring; highest common factor and lowest common multiple; fractions; equations of the first degree involving one or more unknown quantities and problems leading to such equations; discussion of the forms \( \frac{a}{\alpha}, \alpha, \frac{a}{\alpha} \), etc.; inequalities; involution and evolution of algebraic monomials and polynomials, including the extraction of the higher roots; radicals, including the fundamental operations, rationalization, imaginary quantities, binomial surds and the solution of equations containing radicals; pure and affected quadratics; solution of quadratics by factoring; problems involving quadratics; equations solved like quadratics; simultaneous quadratic equations, and theory of quadratics. Students who have thoroughly mastered these sub-
jects in Wentworth's New School Algebra, Well's Essentials of Algebra or text books of an equal grade and who have carefully reviewed them preparatory to taking up advanced work, ought readily to pass the required examination.

An idea of the quality of work demanded can be gained from the sample examination questions which follow:

1. From \((x-y)mn-(a-b)\) \((x+y)-8\) subtract \((2b+5a)\) \((x+y)-8\) \(-(m+5)x^2-ymn\).
2. Multiply \(-8a^8b^{-4}c^{-4} (x-y)\) \((m+n)c\) by \(7a^5b^{-3}c (x-y)^7\) \((m-n)c\).
3. Resolve \(36a^2c^2-81b^2c^2-16a^2d^2+36b^2d^2\) into 4 prime factors.
4. Find the highest common factor of \(6ax^4-2ax^3-2ax^2-2ax-8a\) and \(6ax^4-14ax^3+2ax^2+2ax+8a\).
5. Find the sum of the following and reduce the result to simplest form:

\[
\frac{2(1-3x)}{(1+x)(1+9x)} + \frac{1-2x}{(1+x)(1+4x)} + \frac{2}{1+4x}
\]

6. Divide \(1 + \frac{1}{a^2+b^11-c^2-2ab}\) by \(2- \frac{1}{a-b-c}\)

7. Solve the equation:

\[
\frac{x-1}{4} - \frac{1}{8} \left( \frac{x-5}{4} - \frac{14-2x}{5} \right) = \frac{x-9}{2} - \frac{7}{8}
\]

8. Given \(\begin{cases} mx + \frac{n}{y} = 1 \\ ny + \frac{m}{y} = 1 \end{cases}\) find \(x\) and \(y\).

9. The fore-wheel of a carriage makes 5 revolutions more than the hind-wheel in going 50 yards, and if the circumference of the fore-wheel where increased by one-tenth, and the circumference of the hind-wheel by one-fifth, the former would make 7 revolutions more than the latter in going 198 feet. What is the circumference of each wheel?

10. Expand \((-4a^2x-y^2)^2\).

11. Find the cube root of \(10x^3+12x^5-1-3x^8-6x^2+12x^4+x^9+3x+6x^7-10x^6\).

12. Find the sum of \(\sqrt[3]{54am+8b^3}, \sqrt[3]{16am-8b^0}, \sqrt[3]{2a^4m+9}\) and \(6\sqrt[6]{4a^2m}\).

13. Divide \(7a^8b^3c^3\sqrt{a^2bc}\) by \(ab^5\sqrt{ab^2c^2}\).
14. Find the cube root of \( \frac{a}{3} \sqrt[3]{\frac{a}{3}} \)

15. Find the square root of the binominal surd, \((a+b)^2 - 4(a+b)\sqrt{ab}\)

16. Divide \(\sqrt{48} \div \sqrt{-12}\) by \(-\sqrt{6}\).

17. Solve the equation: \(\sqrt{3x} + \sqrt{3x+13} = \frac{91}{\sqrt{3x+13}}\).

18. A man traveled by coach 6 miles, and returned on foot at a rate of 5 miles an hour less than that of the coach. He was fifty minutes longer in returning than in going. What was the rate of the coach?

19. Solve the equations:
\[
\begin{align*}
2x + y &= 11, \\
x^2y^2 + 28xy - 480 &= 0.
\end{align*}
\]

ENTRANCE REQUIREMENTS IN ENGLISH.

The applicant should show thorough preparation in English, including grammar and elementary rhetoric, and not overlooking spelling, reading, and punctuation. A student who spells poorly will be conditioned in English courses until he is able to spell with comparative accuracy. The applicant should understand the words in current use in good modern prose, and should be able to read aloud with that ease and fluency that betoken a correct understanding of what he reads. His knowledge of grammar should enable him to classify words according to their grammatical properties, to give their inflections and to identify each form, to analyze in detail sentences of modern prose, and, above all, to construct sentences correctly. He should have given sufficient study to punctuation to enable him to use the marks correctly in his own compositions. His knowledge of rhetoric is best tested, not by his readiness to give definitions, but rather by his ability to apply his knowledge of rhetorical principles in his own speech and composition. His speech should be free from gross errors and awkward constructions, and he should be able to write with a fair degree, not only of correctness, but also of ease. For such training, more depends upon the teacher than upon the text-book, but the method pursued in Scott and Denney's "Composition-Rhetoric" is believed in general to produce the best results.
An idea of the extent and nature of the work covered may be gained from the following set of examination questions in English:

**BEGINNING GRAMMAR.**

(For admission to the first term of the Academic Year).

I. (a) Decline I, it, lady, house, James.
    (b) Compare many, noisy, ill, industrious.
    (c) Write the principal parts of go, see, think, drink, blow, snow.

II. Define (a) proper noun, (b) personal pronoun, (c) descriptive adjective, (d) irregular verb, (e) active voice, (f) present perfect tense.

III. Name the kinds of nouns, of pronouns, and of adjectives, and give an example of each.

IV. Write an example of each of the following constructions, and underline the part that stands for the required construction:
   a. Object complement.
   b. Attribute complement.
   c. Infinitive phrase.
   d. Participial phrase.
   e. Adjective clause.
   f. Adverbial clause.

V. Conjugate ride through all the tenses of the indicative mood, active voice.

VI. Give the synopsis of see in the third person, singular number, indicative mood, passive voice.

VII. In the following sentence tell what part of speech each word is: "I went to him joyfully, for I had often heard my mother mention him with esteem."

VIII. Analyze this sentence: "I shall never forget his reception of me; for I believe he thought of my poor mother at the time, and his heart yearned toward his child."

IX. Parse the italicized words: "These are not my books. I think they must belong to some of the boys. What boys have been here since I left?"

**ADVANCED GRAMMAR.** (English I.)

(For admission to the second term of the Academic Year.)

1. Give the synopsis of strike in the third person, singular
number, through the indicative and subjunctive moods, passive voice.

II. How does the subjunctive mood differ from the indicative (a) in form and (b) in use?

III. Define the following, and illustrate each by an example: (a) impersonal verb, (b) direct object, (c) indirect object, (d) adverbial object, (e) objective complement, (f) attribute complement, (g) gerund, (h) infinitive, (i) participle, (j) appositive noun.

IV. Classify each italicized word and state its exact function in the sentence:

They found the box too heavy to lift.
The board is three feet too long.
Boys are hardly expected to be as gentle as doves.
Henry, bring me an apple.
I heard the robins sing last Tuesday.
By working hard we may be able to finish.
He wanted to go to town.
No one questions his willingness to work.
He went to Salem to buy a hat.
It is hard work to shovel sand all day.

V. In the following sentence point out each clause, tell whether principal or subordinate, and if subordinate state its exact function: “I began to think her amazingly pretty as well as clever, and I believe I should have finished by falling in love with her, had not her father discovered our theatrical studies.”

VI. Parse the words underscored in V.

VII. Analyze this sentence: “Culture seeks to do away with classes; to make the best that has been thought and known in the world current everywhere; to make all men live in an atmosphere of sweetness and light, where they may use ideas as it uses them itself, freely,—nourished and not bound by them.”

VIII. Punctuate: “I would not perplex a young mind with punctuation as a system or with nice questions between semicolons and colons but everyone should at an early age be taught the difference between the period and the comma and the principal functions of each every one should be taught too the great principle that a point serves as a guide to construction and through the construction to the meaning of the sentence.”
ELEMENTARY RHETORIC.

(For admission to the first term of the Freshman Year.)

I. Analyze these sentences:
   No man ever loved more than Stanley to look facts in the face, and to know the exact and certain truth. 'Let us be firmly persuaded', he wrote, 'that error is most easily eradicated by establishing truth, and darkness most permanently displaced by diffusing light'.
   Parse the italicized words in I.

II. Correct the following sentences, and explain the correction:
   1. John writes as well or better than Henry.
   2. Tom was laying on the floor when I come in.
   3. He haint got nothing to worry about.
   4. If I was him I would of done it long ago.

IV. Discuss fully and carefully four of the following topics.
   (Give full, complete discussion. A few sentences on each will not suffice:)
   1. The practical value of rhetoric.
   2. The essential qualities of the paragraph.
   3. The respective advantages of the short sentence, the long sentence, and the periodic sentence.
   4. Define purity, propriety, and precision, and state why each should be observed.
   5. The topic sentence; what it is, its position, its value.

V. Write an essay of from 250 to 350 words on two of the following topics:
   1. My reasons for desiring a college education.
   2. A striking contrast—persons, places, or things.
   3. A trying experience.
   4. A visit to _________.

NOTE—These essays are considered an important part of the examination. They will be graded mainly on diction, sentence structure and connection, and paragraphing. Good penmanship, neatness of manuscript, and correct spelling and punctuation are also important.

ENTRANCE REQUIREMENTS IN HISTORY.

For admission to the work of the First Semester of the Academic Year the student is expected to pass a satisfactory ex-
amination in United States history. Standings from the graded schools will be accepted in lieu of the examination. To pursue successfully the work of the First Semester in the Academic year it is expected that the student will have had some drill in the study of historical subjects. This will be determined by the nature of the school work already done.

For admission to the work in history for the Second Semester of the Academic year, the student is expected to pass a satisfactory examination in General History to the Reformation; standings in general history from accredited high-schools are accepted in lieu of an examination on the work in history for the First Semester. Such credit is conditional upon the maintenance of a satisfactory grade of scholarship in the advanced work assigned. Should failure result, any portion of the credit allowed may be cancelled or review without credit be required.

For admission to the Freshman Class besides the requirements to enter the Second Semester of the Academic Year the student is expected to pass a satisfactory examination upon the work of said semester which will be covered by such text-books as Myers “The Middle Ages and The Modern Age” (revised edition of the author’s Mediaeval and Modern History) or Robinson’s “History of Western Europe.” Graduates from fully accredited high-schools are admitted to the Freshman Class without examination, upon the presentation of proper credentials.

Pupils from any of the fully or partially accredited high-schools not graduates may receive credit in the Academic Year, for the work done at the high-school, but such credit is conditioned upon the maintenance of a satisfactory grade of scholarship in the advanced work assigned.

Pupils from high-schools not accredited, who desire credits for the First Semester Academic year will be expected to pass a satisfactory examination in General History to the Reformation.

Graduates and non-graduates from high-schools not accredited who desire to enter the Freshman Class will be expected to pass the entrance examinations as indicated above.

ENTRANCE REQUIREMENTS IN FREE-HAND DRAWING.

For admission to either term of the Academic Year no previous work in drawing is required.

The standings of students from High Schools giving courses in free-hand drawing may be accepted in lieu of the work in free-hand drawing of the Academic Year.
EXAMINATION AT HOME.

The heads of the English, History, and Mathematical departments will cheerfully unite with principals of schools in arranging for such examinations in grammar, rhetoric, history, algebra, and geometry, as will admit students to our Freshman Class. Candidates can arrange also to have questions for examination sent to County Superintendents or other school officers who are willing to conduct the examination. The papers will be forwarded to the heads of the English, History, and Mathematical departments, who will mark the same and notify the applicant of the record received.

The attention of applicants for admission is particularly called to this arrangement, by which all their entrance examinations can be taken at a convenient place near home.

ADMISSION BY CERTIFICATE OF GRADUATION.

SCHOOLS FULLY ACCREDITED.

The following list of accredited schools has been prepared by the Committee on College Entrance Requirements appointed by the State Teachers' Association. The attention of secondary schools is called to the fact that each school to be accredited must have at least three teachers devoting their time exclusively to High School work. A full and complete list of the rules governing accrediting of High Schools and the statement of how a High School may become accredited may be found on pages 2 to 4 of the High School Manual issued by the last State Teachers' Association. Copies of this book may be had free of charge on application to State Superintendent J. F. Riggs, Des Moines.

The graduates of fully accredited schools, who present The Uniform Blank Certificate of Preparatory Credits, properly filled out and certified (see page 40) will be admitted to the studies of the Freshman Year without examination. The students thus admitted will take review work in English and Algebra during the first ten days of the term.

In English this work will be a series of written exercises designed to test the student's general preparation in English, including Spelling, Grammar, Punctuation, and Elementary Rhetoric. This test is intended as a practical one, not as a review in mere theory; memorized rules and principles will
count for little; readiness in applying them is the real test. A student whose sentences are notably incorrect needs further drill in Grammar; one whose paragraphing shows no definite plan needs additional practice in elementary composition.

In Algebra all subjects up to and including quadratics will be treated, and the ability of the student to demonstrate principles and solve examples and problems will be tested. In both English and Algebra a satisfactory examination will be accepted in lieu of this review. (See “Examination at Home,” page 37).

SCHOOLS FULLY ACCREDITED.

Ackley,                          Creighton,
Adel,                            Davenport,
Albia,                           Decorah,
Algonia,                         Denison,
Ames,                            Des Moines, E.,
Anamosa,                         Des Moines, N.,
Atlantic,                        Des Moines, W.,
Audubon,                         Dexter,
Avoca,                           Dubuque,
Bedford,                         Eagle Grove,
Belmond,                         Eldora,
Boone,                           Emmetsburg,
Brooklyn,                        Estherville,
Burlington,                      Fairfield,
Capital Park, Des Moines,        Forest City,
Carroll,                         Fort Dodge,
Cedar Falls,                     Fort Madison,
Cedar Rapids,                    Geneseo, Ill.,
Centerville,                     Glenwood,
Chariton,                        Greene,
Charles City,                    Greenfield,
Cherokee,                        Grinnell,
Clarinda,                        Grundy Center
Clarion,                         Guthrie Center
Clinton,                         Guthrie County,
Columbus Junction,               Hamburg,
Corning,                         Hampton,
Corydon,                         Harlan,
Council Bluffs,                   Humboldt,
Cresco,                          Ida Grove,
Independence, Indianola, Iowa City, Iowa Falls, Jefferson, Keokuk, Knoxville, Lake City, Lamoni, Le Mars, Lyons, Manchester, Manning, Maquoketa, Marengo, Marion, Marshalltown, Mason City, McGregor, Missouri Valley, Moline, Ill., Montezuma, Monticello, Mount Ayr, Mount Pleasant, Muscatine, Nashua, Nevada, New Hampton, Newton, Oak Park, Des Moines, Odebolt, Oelwein, Onawa, Orange City, Osage, Osceola, Oskaloosa, Ottumwa, Parkersburg, Perry, Postville, Red Oak, Reinbeck, Rockford, Rock Rapids, Rockwell City, Sanborn, Sheldon, Shenandoah, Sibley, Sidney, Sigourney, Sioux City, Sioux Falls, S. D., Sloan, Spencer, Storm Lake, Stuart, Taylorville, Ill., Tipton, Traer, Villisca, Vinton, Washington, Waterloo, E., Waterloo, W., Waukon, Waverly, Webster City, West Liberty, West Union, Williamsburg, Wilton, Cedar Valley Seminary, Osage, Charles City College, Denison Normal School, Dexter Normal College, Epworth Seminary, Howe's Academy, Mt. Pleasant, Iowa City Academy, Iowa City, Jewell Lutheran Col., Jewell, Lincoln Academy, Lincoln, Neb., Michigan Military Academy,
SCHOOLS NOT FULLY ACCREDITED

The following list of schools not fully accredited—that is, marked as deficient in one or more subjects—has been prepared by the Committee of the State Teachers' Association. Graduates of these schools who present a Uniform Blank Certificate of Preparatory Credits properly filled out and certified (see page 36) will be admitted to the review work of the Academic Year. To be entitled to credit in the studies of the Academic Year, such students must present to the professors in charge satisfactory evidence of proficiency in that study.

Adair, Holwarden
Allerton, Holstein,
Alton, Hubbard,
Anita, Keosauqua,
Brighton, Kingsley,
Bloomfield, Lake Mills,
Charter Oak, Lime Springs,
Clearfield, Mapleton,
Colfax, Moulton,
Coon Rapids, Mechanicsville,
Correctionville, Milton,
Dysart, Morning Sun,
DeWitt, Mt. Pleasant,
Eldon, Neola,
Elkader, New Sharon,
Farmington, North English,
Fayette, Northwood,
Fonda, Pella,
Fontanelle, Riceville,
Garner, Richland,
Glidden, Rolfe,
Grand Junction, Sac City,
Hartley, Shelby,
Shell Rock, Tama City,  
Sioux Rapids, Tabor,  
Springdale, Wapello,  
Springville, Winfield,  
State Center,  

HOW TO ENTER THE COLLEGE.

Persons who desire to enter the college as new students should comply with the following directions: 1. Study carefully and comply with the "Requirements of Admission." Then write the President giving age, preparation for College work, and the course you desire to take. If a graduate of any High school in the list of "Accredited High Schools" in this state, or of similarly accredited High Schools in any other state, no preliminary examinations will be required for entrance to the Freshman Year in any course. If not a graduate of an accredited High School the conditions of entrance given on page 30 should be carefully followed. 2. Information concerning board and rooms may be secured by writing J. F. Cavell, the College Steward, Ames, Iowa. 3. When you arrive, at the opening of the term, go to the President's office for a card of directions. 4. Students who do not bring certificates of proficiency in the studies required such as meet the approval of the examining committee will need to be examined here. When all the examinations are completed and your standings therein are marked on your examination card, take it to the classification committee in the office of Dean Stanton. If you have passed the studies required you will then sign the students' record book and contract and secure a card of classification, which certifies your admission to the College and assignment to class work. Your name will be entered at once upon the official class lists and will be included in the roll call of the following day. You will be expected to attend thereafter every recitation of the term.

STUDENTS' EXPENSES AND EQUIPMENT.

No charge is made for tuition to Iowa students. To those who come from outside the state $24.00 tuition per year is charged.

Furnished rooms and board can be secured in clubs and private families adjacent to the College grounds at from $3.50 to $4.00 per week.
Every student entering College shall, before being classified, pay a—
Janitor fee of ................................................. $5.00

The current expenses of students who occupy rooms in the College dormitories during the year are as follows:

In Margaret Hall—

**Lighting, heating and incidentals, per week** ............ $ .55
**Room rent, per term** ......................................... 3.00
**Hospital fee, per term** .................................... 2.50

In the Cottages—

**Fuel, lighting and incidentals, per week** ............... $ .40
**Room rent, per term** ......................................... 3.00
**Hospital fee, per term** .................................... 2.50

As security for the payment of bills, students living in the College buildings are required to deposit with the Treasurer ........................................ $10.00

This deposit will be returned on final settlement at the close of term.

In the assignment of the rooms in the College dormitories, students who wish to take the regular four year courses will be given the preference.

All bills for each month must, without fail, be settled at the Treasurer's office by the second Saturday of the month following.

Students using laboratories in the various departments of the College are required to pay a laboratory fee at the beginning of each term to cover expenses of breakage, etc., thus incurred and the professors in charge require the Treasurer's receipt for such fee before admitting the students to laboratory practice.

For amounts of such fees see department courses.

Students purchasing military uniforms will deposit $5.00 with the merchant tailor at the time measures are taken, paying the remainder on delivery.

For heating, lighting, cleaning and care of the College buildings students pay less than the items actually cost the Institution. Injury to College property, of whatever sort, is charged to the author, when known; otherwise to the section or to the entire body of students, as may seem just in the given case.

Students who board in any of the College buildings furnish their own bedding, and all furniture for their rooms, excepting bedsteads, washstands, tables and wardrobes.

Students are earnestly advised to make their rooms comfortable and cheerful. Male students in the two lower classes, not

*See terms of Hospital Department page 43.*
physically disabled, are required by law to take the military drill and purchase uniforms therefor. "Physical disability" must be certified to by the College Physician, on examination.

Text books and stationery may be purchased at the College Book Store, at about twenty-five per cent below the average retail price.

**COLLEGE HOSPITAL.**

The actual sanitary condition of the College is excellent. The buildings are situated on high ground with good natural drainage. The water supply is exceptionally pure and abundant. The sewer system and sewage disposal plant are the best that modern sanitary engineering can devise. Nevertheless in this, as in other like institutions, whose students are drawn from a wide territory, various diseases are brought here by the students themselves. In order to control epidemics and properly care for other cases of illness or injury a hospital is provided. This hospital is under the charge of the College physician, assisted by a professional nurse, a competent housekeeper, and a student hospital steward.

The expenses of the hospital are defrayed from a fund accruing from hospital fees paid by students.

The hospital fee for the term is fixed at $2.50, and is required of all students living in College buildings.

The privileges of the hospital are also extended to students not rooming in the College buildings, provided, 1st, that the physician shall be paid for calls at their residences, and 2nd, that the usual hospital fee shall be paid within the first ten days of the student's arrival.

Students not making the hospital deposit will be admitted to the hospital upon the basis of $10 per week, within the discretion of the college physician.

The hospital fee insures to the payer thereof, medical attendance, nursing and medicine in illness or accident, and consultation and medicine for minor ailments, in accordance with the regulations herein published.

The charges named are based upon the probable actual cost of medical attendance and hospital service, and the fund created is carefully devoted to these purposes. The College can not assume any liability beyond the extent of the fund so created. The hospital has proved to be a great blessing to the students.
The following regulations apply to the privileges of the hospital:

1st. Students entering the hospital shall be charged $3.00 per week for board, room, light and heat. But for any time in excess of three consecutive weeks per term spent in the hospital an additional charge above that mentioned shall be made of $4.00 per week.

2nd. In case a special nurse or physician is employed the expense shall be borne by the particular patient, the selection of such nurse or physician to be approved by the College physician.

3rd. The College assumes no responsibility whatever nor shall the privileges of the hospital be extended to cases of smallpox.

4th. The President and College Physician may require of students entering the college a certificate of a reputable physician showing successful vaccination.

5th. The College Physician is authorized to exclude from the College dormitories and recitation rooms any person afflicted with a contagious disease.

MANUAL LABOR.

SHOP LABORATORY AND FIELD PRACTICE.

The following regulations in regard to manual labor have been adopted by the Board of Trustees:

1. The manual labor of students is divided into two kinds, viz.: Uninstructive labor, which shall be paid for in money, and instructive labor, which shall be compensated by the instruction given and the skill acquired.

2. Uninstructive labor shall comprise all the operations in the workshop, the garden, upon the farm and elsewhere, in which the work done accrues to the benefit of the College, and not to that of the student. Instructive labor shall embrace all those operations in the workshop, museum, laboratories, veterinary hospital, experimental kitchen, upon the farm, garden and experimental stations, in which the sole purpose is the acquisition of knowledge and skill.

3. Students shall engage in instructive labor in the presence and under the instruction of the professor in charge according to the statement made in each of the courses of study.

The compensated labor furnished by the Divisions of Agricul-
DIRECTIONS TO CANDIDATES AND STUDENTS

Details of compensated labor supplied by the needs of the various departments are given to the most faithful and meritorious students in each department. Uninstructive labor is paid for according to its value to the College, but no student should expect to pay the main part of his expenses by labor while here. The College cannot furnish the work, and even if it could, the student's time is chiefly needed for study. Still, many worthy and industrious students pay a considerable part of their expenses by labor, over $4,000 being paid out by the College thus each year to students and post-graduate assistants.

GOVERNMENT.

The relations of our college buildings, and the nature of the exercises, complicated as they are, by laboratory work, shop practice and labor, make order, punctuality and systematic effort indispensable. This institution, therefore, offers no inducement to the idler or self-indulgent. All who are too independent to submit to needful authority, or too reckless to accept wholesome restraint, are not advised to come. The discipline of the College is confined mainly to sending away promptly those who prove on fair trial to be of the said class.

The use of tobacco by students on the college premises is forbidden. Those who are already so addicted to its use that they cannot cheerfully submit to this regulation are advised not to come. Of course the use of intoxicating beverages and of profane and obscene language is forbidden.

PUBLIC WORSHIP.

Officers and students gather daily in the chapel at 11:45 A.M. for public worship. On Sunday morning at 10:45 a discourse is given in the chapel by a clergyman invited for the occasion. The object of these services is to emphasize and enforce the principles of morality and of the Christian religion. Being a state institution we give the utmost freedom to all creeds and forms of belief, avoiding the controversies of sectarianism.

The faculty requires on Sundays such conduct and decorum in and about the college buildings as befit the observance of the Sabbath.
REligious Associations.

The Young Men's and Young Women's Christian Associations of the College are voluntary organizations, composed of students and members of the faculty. The membership is large. The Sunday school, Bible classes and prayer meetings are under their direction, and are well attended and profitable. This voluntary Christian influence in the College is strong and healthful.

Literary Societies.

Seven literary societies hold their meetings each Friday evening, a time kept free from other college functions. These societies supplement the literary work of the College, and besides provide a training in appearing before an audience such as every college graduate needs, a training that is not secured in the class room. Every student is advised to join one of these societies. The societies collectively constitute the Oratorical Association, whose duty it is to provide for four general programs each year; an oratorical contest in the fall term, a declamatory contest in the spring term, and a joint program at the beginning of each term. Six of the societies constitute the I. S. C. Debating League, an organization which arranges for inter-society and inter-collegiate debates. The inter-society debates call out twenty-four debaters each term, four from each society, two of whom maintain the affirmative and two the negative of a given question against opposing teams from other societies. For eight years the League has engaged in annual debate with the students of the Iowa State Normal School. This year a similar debate has been arranged with the students of Drake University.

Courses of Study.

Courses of study leading to the following degrees are offered:

1. The course in Agriculture—Department of Agronomy.
2. The course in Agriculture—Department of Dairying.
3. The course in Agriculture—Department of Animal Husbandry.
4. The course in Agriculture—Department of Horticulture. Each of the foregoing is a four years' course leading to the degree of Bachelor of Scientific Agriculture, (B. S. A.).
5. The course in Veterinary Science, of four years, leading to the degree of Doctor of Veterinary Medicine, (D. V. M.).
6. The course in Mechanical Engineering, of four years.
leads to the degree of Bachelor of Mechanical Engineering, (B. M. E.).

7. The course in Civil Engineering, of four years leads to the degree of Bachelor of Civil Engineering, (B. C. E.).

8. The course in Electrical Engineering, of four years, leads to the degree of Bachelor of Science in Electrical Engineering, (B. Sc. in E. E.).

9. The course in Mining Engineering, of four years leads to the degree of Bachelor of Science in Mining Engineering, (B. Sc. in Mn. E.).

10. The course in Science as Related to the Industries, of four years leads to the degree of Bachelor of Science, (B. Sc.).

11. The course in General and Domestic Science, for women, of four years, leads to the degree of Bachelor of Science, (B. Sc.). Women may take any other course desired.

For the short courses in Agriculture and Dairying certificates properly indicating the completion of certain studies will be given.

For the short courses in Mining and Ceramics, certificates will be given.

SPECIAL LINES OF STUDY.

Students taking special work in any of the College courses must be at least twenty years of age, must give good and sufficient reason for desiring such special classification and must furnish satisfactory evidence that they are thoroughly prepared to pursue the work chosen. Permission to take such special course and the subjects included therein must receive the approval of the President of the College and the Dean or Head of the Department in which the student seeks enrollment.

GENERAL REGULATIONS REGARDING CLASSIFICATION.

Number of Hours.—No student shall be allowed to classify in more hours than are specified in the catalog for the term of the course taken unless he has an exceptionally high record in his previous college work and gives satisfactory reason for desiring to take the additional study. The taking of such additional work is subject to approval by the President of the College and the dean or head of the department in which the student is enrolled.

Back Studies.—Students shall be classified in back studies
In all cases where such studies are taught. Any exception to this rule must be for good and sufficient reasons approved by the President of the College and the dean or head of the department in which the student is enrolled. Ten hours or more of back work will hold a student back in his class.

Junior and Senior College.—The students are now classified in "Junior and Senior Colleges." The "Junior College" is composed of all students in Academic, Freshman and Sophomore years; the "Senior College" of all in the Junior and Senior years.

Professor E. W. Stanton is Dean of the "Junior College" students; Professor C. F. Curtiss is Dean of Junior and Senior students in all agricultural courses, and Professor P. G. Holden Vice Dean; Dr. J. H. McNeall is Dean of Veterinary students.

Professors G. W. Bissell, A. Marston, L. B. Spinney and S. W. Beyer, heads of the engineering departments, are acting Deans in their respective departments. The President of the College is acting Dean of Junior and Senior students in the courses in general science and general and domestic science. Special students take their work under direction of heads of departments in which they specialize.

For information and in classifying, students should write or consult personally the deans or heads of departments in which their work will be taken.

GRADUATING THESIS ES.

The subjects of theses shall be selected under direction of the professor in whose department they are written, and submitted to the Thesis Committee, with signed approval of the Professor, on or before the first Monday in October.

It is expected that each thesis shall represent an amount of work equivalent to at least one exercise per week through the Senior Year; that it shall show the result of the student's personal study or investigation and be throughout original in matter and treatment so far as the nature of the subject will permit; that it shall be prepared under the supervision of the professor in charge, the student making frequent reports of progress and having an outline of matter ready for approval by the first week of the last term.

The thesis, ready for examination and marking, with its specific title and the written approval of the professor in charge, shall be presented to the Thesis Committee at a date fixed by the
committee during the four weeks preceding the Commencement Day.

ADMISSION TO ADVANCED STANDING.

Graduate and undergraduate students of other colleges will be admitted and granted such credits as their work will justify. Work of recognized merit that has been taken at colleges or universities of good rank and standing will be credited for an equivalent amount of work so far as it applies in any of the courses offered at this college. Students taking up work in this way will consult the heads of departments to ascertain the credits to be allowed; these credits may at the option of the head of the department be conditioned on satisfactory work during the student's first term in College.

POST GRADUATE COURSES.

The advanced degrees which are conferred by the faculty of this college are as follows:

1. The degree of Master of Scientific Agriculture (M. S. A.) is open to Bachelors of Scientific Agriculture who are graduates of this college or other colleges offering equivalent courses of study.

2. The degree of Master of Science (M. S.) is open to Bachelors of Science who are graduates of this college or other colleges offering equivalent courses.

3. Professional Degrees in Engineering. (See below.)

REGULATION FOR MASTER'S DEGREES.

1. The opportunity of resident study after graduation is a privilege granted only upon recommendation of the President and the Professors in charge of the departments in which the studies are to be pursued.

2. Between the baccalaureate degree and the master's degree there shall intervene not less than two years, of which the candidate shall devote not less than one year (the second preferred) to resident study at this College.

3. Two lines of work shall be selected, designated as major and minor studies, the former to be given two-thirds and the latter one-third of the time. The major study shall be research work, the results of which shall be incorporated in a thesis.

4. The major and minor studies shall be so selected as to support and strengthen each other.
5. No undergraduate study shall be selected as a major study.

6. The candidate shall have a reading knowledge of French or German.

7. Applications for graduate work shall be filed with the President not later than October first. Such application shall contain a detailed outline of the major and minor studies, approved by the heads of the departments in which the work is to be taken.

8. The candidate for the master's degree shall apply in writing for examinations not later than May 1, and such examination shall be given not later than May 15th.

9. Graduates of other institutions desiring to become candidates for Post-Graduate degrees in this institution shall be required to show to the Committee on Post-Graduate study evidence of undergraduate work equivalent to the corresponding course in this institution, and if any deficiency appear in the subjects elected for Post-Graduate work to make up such deficiency.

ADVANCED DEGREES IN ENGINEERING.

The several departments of the Division of Engineering confer the professional degrees as follows:

In Mechanical Engineering, the degree of Mechanical Engineer, (M. E.).

In Civil Engineering, the degree of Civil Engineer, (C. E.).

In Electrical Engineering, the degree of Electrical Engineer, (E. E.).

In Mining Engineering, the degree of Mining Engineer, (E. M.).

The above degrees are conferred subject to the following regulations:

Applications for professional engineering degrees will be received from graduates of the engineering departments of this College or from graduates in engineering from other colleges offering equivalent courses of study in engineering.

To be entitled to the professional degree, the applicant therefore shall have devoted not less than one year to resident study along lines satisfactory to the engineering faculty, shall have been engaged for not less than one year in a responsible professional position, and shall present a satisfactory thesis, or he shall
have been engaged for not less than five years in a responsible professional position and shall present a satisfactory thesis.

In this connection a responsible professional position means practical engineering experience, requiring the exercise of skill or executive ability in designing or construction work. References or personal knowledge of the facts will be required by the engineering faculty.

Further information as to the lines of work open to graduate students can be found under the several courses of study described elsewhere.
DIVISION OF AGRICULTURE

AGRONOMY.
DAIRYING.
ANIMAL HUSBANDRY.
HORTICULTURE.
AGRICULTURAL CHEMISTRY.
SCIENCE OF AGRICULTURE,
OFFICERS OF INSTRUCTION

ALBERT BOYNTON STORMS, A. M., D. D.
President.

JAMES WILSON, M. S. A.,
Lecturer.

CHARLES F. CURTISS, B. Sc., M. S. A.,
Director of Experiment Station and Dean of Agriculture.

**J. L. BUDD, M. H.,
Professor Emeritus in Horticulture.

ALFRED ALLEN BENNETT, M. Sc.
Professor of Chemistry.

W. J. KENNEDY, B. S. A.,
Professor of Animal Husbandry and Vice Director of Experiment Station.

GEORGE LEWIS McKAY,
Professor of Dairying.

PERRY G. HOLDEN, M. S., B. Ph.,
Professor of Agronomy and Vice Dean of Agriculture.

ARTHUR THOMAS ERWIN, M S.
Acting Professor of Horticulture and Forestry.

W. H. STEVENSON, A. B.,
Professor of Soils.

C. J. ZINTHEO, B. Sc.
Professor of Farm Mechanics.

JOHN H. McNEALL, V. M. D.,
Dean of Veterinary Science and Professor of Anatomy and Surgery.

CARL W. GAY, D. V. M.,
Professor of Pathology and Histology.

FRANK W. BOUSKA, B. S. A.,
Instructor in Dairy Bacteriology.

W. J. RUTHERFORD,
Assistant Professor of Animal Husbandry.
Assistant Professor in Charge of Agricultural Chemistry.

G. I. CHRISTIE, B. S. A.,
Assistant in Soils.

E. C. GASSER,
Assistant in Shop Work.

EDWARD E. LITTLE, M. S. A.,
Assistant in Horticulture.

THOS. S. HUNT, B. S. A.,
Assistant in Field Experiments.

EDGAR WILLIAM STANTON, M Sc.,
Professor of Mathematics and Economic Science.

GEN. JAMES RUSH LINCOLN,
Professor of Military Science.

LOUIS HERMAN PAMMEL, B. Ag., M. Sc., Ph. D.,
Professor of Botany.

GEORGE WELTON BISSELL, M. E.,
Professor of Mechanical Engineering.

ANSON MARSTON, C. E.,
Professor of Civil Engineering.

MISS LIZZIE MAY ALLIS, M. A.,
Professor of French and German.

LOUIS BEVIER SPINNEY, B. M. E., M. Sc.,
Professor of Physics.

SAMUEL WALKER BEYER, B. Sc., Ph. D.,
Professor of Geology.

ALVIN B. NOBLE, B. Ph.,
Professor of Rhetoric and English Literature.

HENRY E. SUMMERS, B. S.,
Professor of Zoology.

ADRIAN M. NEWENS, B. O.,
Professor of Elocution and Associate in English.

ORANGE HOWARD CESSNA, A. M., D. D.,
Professor of History and Philosophy.
THE DIVISION OF AGRICULTURE

CHARLES F. CURTISS, DEAN.

PERRY G. HOLDEN, VICE DEAN.

COURSES OF STUDY.

The instruction in agriculture is divided into the following departments:

I. Department of Agronomy.
II. Department of Dairying.
III. Department of Animal Husbandry.
IV. Department of Horticulture.
V. Department of Agricultural Chemistry.

The courses in these several departments unite in making a
foundation for the student upon which he can build a successful career as a farmer, or develop into a specialist in the many possible lines that are branches of the farming industry. The studies pursued in each department are equally recognized as being necessary to fully equip the student for the highest order of work in any division of agriculture, and the only difference between the shorter and the longer courses is due to the degree to which the student wishes to specialize and develop himself for a single line of work. The farm as it is commonly conducted is a union of many divisions of industry and the shorter course confines itself to laying a foundation that will secure success in all of these, while the longer course seeks to direct the student into that line which will call forth and centralize his special ability and at the same time enable him to meet the variety of conditions that under all circumstances surround a successful life.

Past experience with the courses of these departments shows that they have met with more than the usual success in attaining their objects; as the shorter course has been productive of many successful farmers, and the longer course has been unusually successful in developing better farmers and more capable men in practical life and also in securing for our graduates prominent positions in the agricultural faculties of other colleges.

In practical agriculture, a field unsurpassed by any other college in the United States is open to the students. The national government gives to the college about thirty-five thousand dollars annually for original experimentation and instruction in agriculture and the sciences related to the industries. This supplemented by liberal state aid, enables the College authorities to make the fields and the barns veritable laboratories of extensive and most practical investigation and observation. The range is from the soil that produces, through all of its natural characteristics, to whatever is grown in agriculture from germ to finish. Two commodious, well-lighted stock judging pavilions have recently been constructed, into which live animals are brought in the presence of the teacher and the class for careful study and intimate knowledge. An experimental barn with the recent and most approved methods of stalls, feeding and ventilation, is devoted exclusively to the original work of animal husbandry and agronomy. This work ranges over all the questions of breeding and maturing domestic animals.

The agricultural college is designed to teach the sciences
that underlie practical agriculture, and sufficient English literature, mathematics, history, and other supplementary studies to sustain both scientific and practical agriculture and to develop the agricultural students to the intellectual level of the educated in any profession. Special attention is given to the improved methods in all of the various operations of farming, farm building, use of tools and machinery, and management of all kinds of stock and crops. The instruction of this department embraces principles and practice of agriculture.

The farm consists of 800 acres of rolling prairies, bottom, and woodland, and is stocked with good representatives of six breeds of horses, six breeds of cattle, seven breeds of sheep, and six breeds of hogs. These animals are used in class illustration and for the various experiments in breeding and feeding for milk, meat, wool, growth and maintenance, conducted by the Experiment Station as a department of the College. All the crops of the farm are grown for some educational purpose; all the animals are fed by rule and system, and the result of their management reported upon, and used in class work. Labor is not compulsory, but students in the agricultural course are given work that is educational and parallel with their studies. Some students pay for their board by work in the mornings and evenings. Under direction of the professor in charge, students assist in conducting experiments in lines related to their studies.

DEPARTMENT OF AGRONOMY.

PERRY G. HOLDEN, PROFESSOR OF AGRONOMY, AND VICE DEAN.
W. H. STEVENSON, PROFESSOR OF SOILS; C. J. ZINTHEO, PROFESSOR OF FARM MECHANICS.
W. H. OLIN, ASSISTANT PROFESSOR OF FARM CROPS; G. I. CHRISTIE, ASSISTANT IN SOILS; T. S. HUNT, ASSISTANT IN FIELD EXPERIMENTS; E. C. GASSER, ASSISTANT IN SHOP WORK.

Agronomy is the science of the field and its crops, and treats of (a) Farm Management; the application of economic business methods to farm practices. (b) Field Crops; their classification, production and improvement. (c) Soils; their fertility, cultivation and improvement. (d) Farm Mechanics; the tools, machinery, fences and drains of the farm.

AGRONOMY I.—GRAIN JUDGING

This includes score card practice and grading samples of Corn, Wheat and Oats.
   (a) Study of individual ears.
   (b) Comparative study of a group of ten ears.
   (c) Practical work, judging representative types of varieties of corn raised in Iowa.
   (d) Study of desirable and undesirable characteristics in seed ears.
   (e) Study of best methods of selecting, storing and planting seed corn.

Laboratory work is given together with class recitations; the student makes a careful study of the relation of stand of corn to yield, adaptation of varieties of corn to climate and soil conditions, cultivation, methods of harvesting, cost of production and uses of the crop grown.

2. Wheat Judging.
   (a) Study of physical characteristics.
   (b) Relative chondrometer weights.
   (c) Study of weed seed, dirt and other foreign materials in different grades of wheat.
   (d) Per cent of damaged, smutty or musty grain in samples submitted to class.
   (e) Best methods of selecting, treating, and storing seed wheat.

Laboratory work is given together with class work upon preparing seed bed and harvesting wheat, adaptation of classes of wheat to climatic and soil conditions, cost of production and uses of crop grown. Field notes will be taken on growing fall wheat found in vicinity of College.

3. Oat Judging.
   (a) Same as in wheat study.
   (b) Per cent of meat to hull, empty and pin oats.
   (c) Best methods of selecting, treating and storing seed oats.

Laboratory and class recitations along lines similar to those given in wheat judging. Recitation—3 hours per week. Laboratory—6 hours per week.

AGRONOMY II.—FIELD CROPS. Crop Production.

The term's work consists in a study of the principles underlying reproduction, germination, plant growth and improvement of crops. Special attention is given, in this course, to the field crops of Iowa. The class work will be supplemented by laboratory and field work, applying the principles brought out in the recitation work. The student in his laboratory work is led to make special study of the circumstances that influence vitality of the various farm seeds; methods and time of planting; thick and thin seeding; proper depth to plant to obtain most favorable germination of the different field crops; root systems of different plants in the same and different soils; different methods of culture and cropping; how to treat farm seeds to arrest loss by fungus diseases; shrinkage in harvested grain; value and importance of careful seed selection; field crop data in Iowa and the Nation; forage crops for Iowa farms; economic uses and value of the various crops of the farm. Laboratory six hours per week. Recitations three hours per week.

Required. Agronomy I.

1st year. 2nd Semester. W. H. Olin, Instructor.

AGRONOMY III.—FIELD ENGINEERING.

(a) Plotting the Farm.—This includes methods of laying out the farm, the arrangement of the fields for rotation of crops, mapping and plotting the fields, and system of records kept of the crops of the different fields.

(b) Road construction.—The location and building of roads leading to different parts of the farm, the construction of country roads such as gravel, dirt, macadam, and oiled roads, and practice in using road machinery.

(c) Farm Location.—The location of the building site, and the arrangement of the farm buildings, pastures, water supply, garden plots, lawns, etc.

(d) Fence Construction.—Consisting of setting and testing of fence posts, designing gates, operating fence building machines, and testing of fence wires.

(e) Drainage.—The study of the road, field and sanitary drainage, the different systems of tile drains, methods of leveling and digging ditches by hand and by machinery, the laying of tile, the inspection and filling of tile ditches, the study
of open ditches, methods of construction, location of drainage districts, and the study of drainage laws.

(f) Irrigation.—Location and construction of dams, plotting irrigation fields, construction of irrigation ditches, leveling land for irrigation and practice in the use of implements and tools for irrigation purposes. Planning of irrigation districts and the study of irrigation laws. Practice will be given in drawing, lettering, making maps, using leveling instruments, and operating well, road, drainage and irrigation machinery. Recitation.—3 hours, Laboratory 6 hours per week. Professor Zintheo.

AGRONOMY IV.—FARM MACHINERY.

A complete course in the construction of various farm implements will be given. Binders, mowers, corn binders, huskers, and shredders will be assembled by the students. The principles of construction of all forms of machines used on the farm will be studied. The history of the development of the various machines will be investigated. Corn planters and grain drills will be calibrated to determine the accuracy of dropping the corn and the uniformity of sowing the grain. A study will be made of wagons, buggies, plows, harrows, and all styles of cultivators, and the construction of the different machines will be compared. Threshing separators and grain cleaners will be operated by the students.

FARM MOTORS.

A comprehensive course in traction engines will be given; the construction of boilers, steam engines, valves and cylinders will be studied and practice given in the firing and cleaning of boilers and the operating of engines etc. Gasoline engines and their construction will also receive careful study and practice will be had with the different styles of engines. Windmills and their construction will be studied and experiments carried on to determine the amount of power to be obtained from windmills with different velocities and densities of winds.

BLACKSMITHING.

In the blacksmith shop the students will learn to iron the articles made in the wood shop, they will also learn how to make and temper tools, sharpen plow lathes and do the general repair work on the farm.
HOreshoeing.—This will include rectifying, calking, and fitting of horse-shoes; at first to models of horse’s feet. Later-practice will be had in preparing horse’s feet for the shoes and in shoeing horses. Three Recitations.—Six hours Laboratory work per week.—Required. Agronomy III.—Sophomore year, Professor Zintheo.

AGRONOMY V. SOILS; SOIL PHYSICS.

This course comprises a study of the origin, formation and classification of soils; soil moisture and methods of conserving it; soil temperature, and conditions influencing it; soil texture as affecting the supply of heat, moisture and plant food; surface tension, capillarity, osmosis, and diffusion as affecting soil conditions; the effect upon the soil and the crop of plowing, harrowing, cultivating, rolling and cropping; washing of soils and methods of preventing the same; preparation of seed beds, cultivation and drainage as affecting moisture, temperature, root development, and the supply of available plant food.

The work of the class room is designed to give the student an opportunity to study the different methods of handling soils and the effect of these methods upon the moisture, temperature, texture, and productiveness of the soil.

In addition to the work of the class room six hours each week throughout the term will be devoted to laboratory work. A commodious and well appointed soil laboratory has been equipped on the first floor of Agricultural Hall. The laboratory is fitted for seventy-five students. The desks, hoods and balance room are of the latest design and afford every opportunity for accurate and scientific work. Each student is supplied with a complete outfit of desk apparatus for individual work and has within easy reach, water, gas, steam and compressed air.

The centrifuge, shaker and other pieces of soil apparatus are run by individual motors.

Nearly three thousand dollars have been expended for new soil apparatus during the past year. This very complete line of apparatus and the new laboratory afford unsurpassed facilities for soil work, not only for the regular students but also for those who desire to pursue advanced or post graduate courses.

The Department of Soils also has two large rooms in the new green house, which are devoted to pot culture work and
various lines of soil experimental work. An ample number of plots on the Station farm are also available for class and experimental work.

Special attention will be given to the mechanical analysis of soils by the centrifugal method employed by the Bureau of Soils, U. S. Department of Agriculture. The work will also comprise the determination of the specific gravity, apparent specific gravity, volume, weight, porosity, water holding capacity, and capillary power of various soils; also a study of the effect of mulches on the evaporation of water from the soil and the physical effects upon the soil of different systems of rotations and of continuous cropping. Junior year. First Term Three Recitations and six hours Laboratory work per week. Professor Stevenson and Mr. Christie.

AGRONOMY VI.—SOILS; FERTILITY.

Maintenance of Fertility, Fertilizers and Rotation.—The influence of commercial fertilizers, barn yard manure, and green manuring upon the quality and yield of various crops; the effect of different crops upon the fertility of the soil and upon succeeding crops; different systems of rotation and the effect upon the productiveness of the soil of various methods of farm management; also a study of the storing, preserving and application of barn yard manure.

This work will be supplemented by a laboratory study of manures and fertilizers; their composition and agricultural value. Pot and field experiments will be conducted to show the influence of fertilizers, applied to the soil in different quantities and at different times, upon the quality and yield of various crops. Leguminous crops as fertilizers and their place in farm rotation. A study will be made of special types of soil in different sections of the State, such as the clay and peat soils of Iowa with special reference to the best methods of handling and cropping these soils. Required. Agronomy V. Chemistry III. Junior year. Second Term. Three Recitations and six hours laboratory work per week. Professor Stevenson and Mr. Christie.

AGRONOMY VII.—Research work.—The student may choose any one of the following lines of work:

(a) Special Work in Soil Physics.—This course is offered for students who desire to pursue advanced work in the
study of the physical properties of soils. The Department of Soils is well equipped with apparatus for the determination, by electrical methods, of the temperature, moisture and soluble salt content of various soils under actual field conditions.

The organic content of soils will be determined by the method employed by the Bureau of Soils, U. S. Department of Agriculture.

When possible field experiments will be conducted to show the effect upon the soil conditions of different depths of plowing, harrowing, cultivating, rolling, fallowing, and different methods of preparation of seed beds.

A study will be made of the physical properties of peculiar types of soil found in the State and of methods of redeeming them and rendering them productive. Professor Stevenson.

(b) Special Problems Regarding the Fertility of the Soil.—This course is designed for students who desire to continue their investigation of the soil. Problems of special interest regarding the fertility and productiveness of particular types or classes of soils will be studied. The nature and quantity of the elements of fertility in the soils investigated will be determined and pot cultures and plot experiments will be conducted to show the effect upon the growth and yield of various crops of fertilizers added to the soil.

This work will be supplemented by assigned readings. The student will study the results published by authorities on these lines of investigation and will also present in written form the results of his own investigations and experiments. Arrange time. Professor Stevenson.

(c) Research Work; the Improvement of Farm crops; methods of selection and hybridization; effects of inbreeding and crossing; plans for breeding fields; methods of taking records and recording pedigrees; methods for testing vitality and purity of seeds; a study of the organs of reproduction with special regard to their arrangement for cross or close pollination; the study of the results of experiments in crossing and selection and other means of improvement. Required. Agronomy I. and II.—W. H. Olin, Instructor.

(d) Research Work; Special Crops.—Research work with special crops under the outline of grain, forage, root, fibre, and other crops produced for special purposes. This course is
arranged so as to permit the student to specialize and pursue independent investigations with those crops in which he is particularly interested. The recitations will cover the distribution, development of varieties, details and methods of production, special methods of preparation or manufacture, and uses. The laboratory work will consist of a series of special experiments in the green houses or fields, arranged for each student. These experiments will be planned, carried out, and the results presented in acceptable form by the student. This work will be supplemented by a study of previous experiments and the preparation of a bibliography of such work. Required. Agronomy I., II., III., and IV.; 3rd year. 2nd Semester and 4th year 1st Semester. P. G. Holden and W. H. Olin.

(e) Farm Mechanics; Irrigation.—This course is offered for students who wish to prepare themselves for the irrigation fields; it will consist in special investigation of the effects of irrigation on the yield of crops in humid climates as compared with non irrigated land. A study will be made of the various forms of irrigation pumps, and other machinery. The construction of reservoirs, and the design of flood gates, etc. Prof Zintheo.

(f) Traction Tests.—The effect of draft on different conditions and grades of roads for different heights of wheels and different widths of tires of farm wagons will be studied and the results compared with friction and roller bearing axles on farm wagons and other vehicles. Prof. Zintheo.

(g) Farm Telephones.—This will consist in a study of the various makes of telephones as used in rural districts, and comparison of their efficiency. Practice will be had in the construction of rural lines and the effect of correct vs. wrong methods of using the 'phones will be investigated.

(h) Photography.—This course will consist in studying the principles and practices in photographic work with special stress laid upon landscape photography and country scenes. Practice will be given in taking views, developing plates and films, toning and fixing prints and in other branches of the art. Prof. Zintheo.

AGRONOMY X.—HISTORY OF AGRICULTURE.

A study of the development of Agriculture from the dawn of civilization; through the Epoch of Greek and Roman farming;
the days of the anchorites of the Middle Ages; feudal farming; dawn of modern methods and practices in Agriculture.

A comparison of the agricultural methods of other countries with our own country; influence of different practices upon social conditions of the people. Each student is expected to prepare a bibliography from references used in this work and to clearly and definitely outline the same. 4th year, 2nd Semester. W. H. Olin, Instructor.

AGRONOMY XI.—IMPROVEMENT OF FARM CROPS.

This is a study of the principles that underly the development and breeding of the different field crops. It is a study of the plans and methods used in Field Crop Nursery work. Required Agronomy I, II, III, IV, V. W. H. Olin, Instructor.

AGRONOMY XII.—FARM IMPLEMENT DESIGN.

This course includes the design and construction of implements as now used on the farm or the invention of such new implements as the experience of the students and the men in charge of the Farm Mechanics Department may suggest. The strength of the various kinds of materials entering into farm implements will be studied and tested in the laboratories and experiments will be carried on in the field to determine the efficiency of the work done by machines made by the students.—Elective to all agricultural students who have completed Agronomy III., and IV. Prof. Zintheo.

AGRONOMY XIII.—RURAL ARCHITECTURE.

(a) This course embraces the planning of farm buildings, farm granaries, silos, machine sheds, living houses; their construction, cost and conveniences; the study of the different stalls, cribs, etc., also testing the strength of building material, cements, etc. Complete plans, specifications, and price lists of material will be made by the students; the ventilation of buildings will be studied, and the arrangement of windows for lighting the buildings will be investigated. During the laboratory period work will be done in the carpentry shop and models of various buildings will be made, and practice given in cutting joists, making windows, doors, etc.

(b) Farm Water Supply.—Including the making of plans for and the construction of a system of water supply available to all buildings on the farm and such field plots in
which water is required. It will include the study of the construction and repair of pumps, wind-mills, water tanks and pipes; practice work will be given in pipe fitting, the bracing of collars, the repair of leaky valves, and plumbing.

(c) Handy Labor Saving Devices on the Farm.—This will consist in studying the methods of construction, assembling, operating and repairing numerous labor saving devices about the farm home.

(d) The Farmers Work Shop.—Besides the practice which up to this stage has been obtained in carpentry work, the students will be taught to make neck yokes, whiffle trees, tongues, wagon wheels, and other parts of the wood work of farm machinery. Elective to all agricultural students who have completed Agronomy III and IV. Professor Zintheo.

POST GRADUATE WORK IN AGRONOMY.

I. GRAIN JUDGING.

Commercial grading of corn, wheat and oats.

Practice in grading samples of corn, wheat, oats and other grains, according to the inspectors' or buyers' standards. A careful study of the commercial rating of grain. At least six weeks practice under a reliable, efficient inspector at an important grain center, required before finishing the course. The object of this course shall be to make the student thoroughly familiar with commercial grades of grain and prepare him for a position as a grain inspector.

II. FIELD CROPS.

1. Special study of Forage Crops.—Clover, cow peas, soy beans, sorghum, rape, etc.
2. Special Study of corn.
3. Special study of wheat.
4. Special study of oats.
5. Special study of Sugar Beets.
6. Seed testing and Seed Germination.
7. Plant breeding as applied to cereals.
8. Plant breeding as applied to special forage crops.
9. Study of the economic methods of growing and handling the various crops of the field.
10. Relation of crop productions to the Nation's commerce. This work is planned to give the graduate work that shall
prepare him for a position with seed firms, for work along special seed or crop lines in the U. S. Department of Agriculture, or fit him to solve the complex problems of the farm.

Other questions that students may desire to take up shall be outlined, by party desiring to take the work, with the instructor of his course.

III. FARM MECHANICS.

1. Investigation of draft of different implements, effect of good and bad adjustment of different tools upon power required for efficient work.
2. Study of Silos.
3. Experiments with different kinds of cultivators, for various purposes.
4. Study of the construction of different kinds of fences and their fitness for various purposes.
5. Farm Building construction.
6. The improvement of corn tools.
7. Investigating the construction of harvesters and mowers.
8. The study of irrigation machinery.
9. The cheapest and best form of motive power on the farm.

Any other subject along the line of Agricultural Engineering that the student is interested in and for which he is fitted, by previous training, may be taken up. The work is designed especially for those who wish to fit themselves for government positions along Irrigation and Agricultural Engineering lines, also for those who wish to teach the subject of farm mechanics in Agricultural Colleges and to act as foremen, superintendents, etc., in connection with farm properties, manufacturing and implement concerns.

IV. SOILS.

1. Study of soils fitting for special work in U. S. Bureau of Soils, College and State Experiment Station work.

The post-graduate work in soils will consist in the study of special lines of investigation in soil physics, soil fertility, and soil bacteriology.

V. FARM MANAGEMENT.

1. Special investigation of some of the most serious wasteful practices of the farm; how to remedy them.
2. Special business methods for special farm conditions.
3. Special vs. mixed farming.
4. Investigation of methods practiced by farmers in keeping a record of the elements of loss and gain on their farms, bibliography to be completed showing resulting losses and remedies suggested.

This work is designed to prepare young men for farm managers, and superintendents for both large and small farms. There is a constant demand for competent men for such positions.

SHORT COURSE IN CORN JUDGING, 1905, JAN. 2 TO 14.

During the winter vacation a two weeks' course in corn judging will be given. This course is planned with special reference to meeting the demand for work along this line by the farmers of the State who are not able to take advantage of the work in the regular College course. A fire proof two story stock and grain judging pavilion has been erected for this work. Instruction will be given in the methods of selecting, testing and preparing seed corn for planting.

Instruction will also be given in the methods of cultivation, characteristics and adaptability of different varieties of corn to various sections of the State.

A comparison of corn cultivators, and of planter tests with both rotary and edge drop planters, will be made. Samples of all the leading varieties of corn grown in Iowa will be on exhibition and will be used for corn judging purposes.

Those wishing to become corn judges qualified to judge corn at farmers' institutes, fairs and expositions, will have an opportunity at this corn school to prepare for this work. An examination will be held at the close of the school, and corn judging certificates will be issued, by the Iowa Corn Growers' Association, to those who prove themselves proficient. The importance of being able to select good seed for next year's crop can scarcely be overestimated.

To partially cover the expense of additional instructors and facilities for judging, a tuition fee of $2.00 will be charged. but one fee will cover the instruction in both stock and corn judging. The work during this course will be so arranged that the students' time will be divided equally between corn and stock judging.
PREMIUMS FOR CORN.

During this corn school a corn contest will be held and the following prizes will be offered:

A. E. COOK TROPHY—$1,500.

Mr. A. E. Cook of Odebolt, Iowa, has presented the College with a trophy costing $1,500, to be awarded in such manner as the College may determine.

WHITING TROPHY—$450.

The Hon. W. C. Whiting, World's Fair Commissioner of Agriculture for Iowa, offers a $450 trophy for the Grand Champion sample of 10 ears of corn.

WALLACES' FARMER TROPHY—$250.

The Wallace's Farmer offers a $250 challenge trophy for the Grand Champion sample of 50 ears of corn exhibited by any Farmers' Club, Farmers' Institute or Corn Club.

FARMERS' TRIBUNE TROPHY—$100.

The Farmers' Tribune offers a $100 trophy for the person winning first place in the corn judging contest.

THE ONE HUNDRED EAR TROPHY PRIZE.

The Burg Wagon Company of Burlington, Iowa, offers a fine nickle plated wagon worth not less than $1,500 for the best 100 ears of corn, any variety, competition open to the world.

This wagon was exhibited at the World's Fair at Chicago in 1893 and will be at the Louisiana Purchase Exposition at St. Louis in 1904.

At the close of the Exposition this wagon will be presented to the Iowa Corn Growers' Association to be given as a grand sweepstakes trophy prize at the corn contest at Iowa State College, Ames, Iowa, January 2-14, 1905.

COURSES IN AGRICULTURE.

AGRONOMY.

ACADEMIC YEAR.

FIRST TERM.

Algebra, 5
English, 5

(Mathematics, I.)
(English, I.)
DIVISION OF AGRICULTURE

History, 5
Elocution, 2

SECOND TERM.

Advanced Algebra and Plane Geometry, 5  (Mathematics, XIII.)
Elementary Botany, 2  (Botany, I.)
Elementary Rhetoric, 5  (English II.)
History, 4  (History, II.)
Elocution, 1  (Elocution, II.)

FRESHMAN YEAR.

FIRST TERM.

Corn and Grain Judging, 5  (Agronomy, I.)
Live Stock and Score Card Practice, 2  (Animal Husbandry, I.)
Market and Home Gardening, 2  (Horticulture.)
German, 5, or  (Language, V.)
French, 5  (Language, I.)
Advanced Rhetoric, 5  (English, III.)
History, The Formation P., 1  (History, XVII.)
Military, 2  (Military, I.)
Library work, 4 hours per term.

SECOND TERM.

Field Crops, 5  (Agronomy, II.)
Live Stock and Score Card Practice, 2  (Animal Husbandry, II.)
Plant Propagation and Small Fruits, 3  (Horticulture.)
Solid Geometry, 2  (Mathematics, XVII.)
German, 5, or  (Language, VI)
French, 5  (Language, II.)
History, The Am. Nation, 1  (History, XVIII.)
Entomology, 2  (Zoology, I.)
Composition, 1  (English, IV.)
Military, 2  (Military, II.)

SOPHOMORE YEAR.

FIRST TERM.

Farm Mechanics, 5  (Agronomy, III.)
Live Stock and Score Card Practice, 3  (Animal Husbandry III.)
Pomology, 3  (Horticulture.)
Chemistry, 5  (Agricultural Chemistry, XXI.)
Meteorology, 3  (Geology, I.)
Composition, 1  (English, V.)
Military, 2  (Military, III.)

SECOND TERM.

Live Stock and Score Card Practice, 4  (Animal Husbandry, IV.)
Farm Mechanics, 5  (Agronomy, IV.)
Agricultural Geology, 3  (Geology, IX.)
Histology, 4  (Botany, III.)
Chemistry, 5  (Agricultural Chemistry, XXIII.)
Composition, 1  (English, IV.)
Military, 2  (Military, IV.)

JUNIOR YEAR.

FIRST TERM.

Soils, 5  (Agronomy, V.)
Chemistry, 4  (Agricultural Chemistry, XXV.)
Farm Dairying, 2  (Dairying, VII.)

Elective.

Farm Implement Design, 4  (Agronomy, XII.)
Histology, 2  (Veterinary Science, XXXIII.)
Comparative Physiology, 1  (Veterinary Science, XXI.)
Economic Entomology, 5  (Zoology, IV.)
Geology, 5  (Geology, II.)
Physical Laboratory, 1 or 2  (Physics, XIV.)
Political Economy, 5  (Economic Science, I.)
Drama, 3  (Literature, I.)
The Drama in Translation, 2  (Literature, VIII.)
Debating, 1  (English, VII.)
Elocution 2  (Elocution, III.)
German, 5  (Language, V.)
French, 5  (Language, III.)
Principles of Breeding, 2  (Animal Husbandry, VIII.)
History, 16th, 17th, and 18th Centuries, 3  (History V.)
History, The Renaissance, 2  History, X.)
Military Science, 1  (Military V.)

SECOND TERM.

Soils, 5  (Agronomy, VI.)
Research Work, 2  (Agronomy, VII.)
Bacteriology, 2  (Botany, VII.)
Comparative Physiology, 1 (Veterinary Science, XXII.)
Rural Law, 1 (Agronomy, XI.)
Improvement of Field Crops, 2 (Horticulture.)
Forestry, 3 (Botany, XII.)
Public Speaking, 1 (Botany, III.)
Vegetable Cytology, 3 or 5 (Geology, VI.)
Histology, 4 (Elocution, VIII.)
Mineralogy, 4 (Elocution, IV.)
Finance, 3 (Economic Science, V.)
Money and Banking, 2 (Economic Science, IV.)
Epic and Lyric Poetry, 5 (Literature, II.)
Elocution, 2 (Elocution, III.)
French 5, or (Language, II.)
German, 5, (Language, VI.)
Debating, 1 (English, VIII.)
Rural Architecture, 4 (Agronomy, XIII.)
History, French Revolution and XIXth Century, 3 (History, VI.)
History, Constitutional History of England, 2 (History, X.)
History, American Nation, (History, XVIII.)
Military Science, 1 (Military, VI.)

SENIOR YEAR.

FIRST TERM.

Farm Management, 5 (Agronomy, VIII.)
Research Work, 2 (Agronomy, VII)
Chemistry, 4 (Agricultural Chemistry, XXVII)

Selective.

Dairy Bacteriology, 3 (Dairying, XVII.)
Buttermaking, 3 (Dairying, XIV.)
Comparative Physiology, 2 (Veterinary Science, XXIII.)
Geology, 5 (Geology, II.)
Political Economy, 3 (Economic Science, III.)
History of Political Economy, 2 (Economic Science, II.)
Psychology, 5 (Philosophy, I.)
American Literature, 3 (Literature, IV.)
The Short Story, 2 (Literature, VI.)
Elocution, 2 (Elocution, V.)
Oration, 1 (Elocution, IX.)
French, 4, or (Language, III)
German, 4  
Landscape Gardening, 2  
History, the Formation of the Union. American History to 1829, 3  
Chemistry, 5  

**SECOND TERM.**

Thesis Work, 2  
Animal Nutrition, 5  
Animal Nutrition, 5

**Elective.**

History of Agriculture, 2  
Dairying, 3  
Cheesemaking, 3  
Comparative Physiology, 2  
Technology of Milk, 1  
Advanced Entomology, 3 or 5  
Advanced Bacteriology, 3  
Geology, 5  
Ethics, 3  
Novel and Romance, 3  
The Essay, 2  
Elocution, 2  
History, Division and Reunion, American History 1829 to present time, 3  
History, The Far Eastern Question, 2  
Astronomy, 5  
Chemistry, 5  

DEPARTMENT OF HORTICULTURE AND FORESTRY.

**A. T. ERWIN, ACTING PROFESSOR.**

**L. L. LITTLE AND M. L. MERRITT, INSTRUCTORS.**

**J. ERDMANN, GARDENER.**

The Department of Horticulture has offices, classroom and library on the second floor of Agricultural Hall, a laboratory
building 35x50 feet, two stories high with a nine foot basement, and greenhouses of the modern construction, containing over 5,000 square feet under glass.

The main floor of the laboratory is divided into two rooms and will accommodate fifty students. One of the rooms is especially fitted for the study of fruits, and opening from it are two refrigerators for the storing of specimens. The second floor contains photographic and dark rooms for the department, and the horticultural museum, equipped with a full collection of horticultural implements and machinery. The museum also contains a large collection of fruit models and a horticultural herbarium that is accessible to advanced students.

The greenhouses give every opportunity for the student to become familiar with the management of plants under glass, and the collection has been made with the view of representing species of the greatest educational value.

The department has a large library which is kept in the offices in Agricultural Hall and in addition to the complete files of horticultural publications of the country, possesses the private library of Charles Downing, the author of "Fruits and Fruit Trees of America," which contains many rare horticultural works as well as his original notes and manuscript.

The land devoted to Horticultural purposes comprises about forty acres. In this area are orchards of varying ages from fifteen years down to those set within the last two years. The varieties of fruits on trial number more than one thousand, and include the hardiest types of native and foreign kinds. The student is thus afforded unusual facilities for observation and study. Adjacent to the orchards and small fruit plantations are the nursery grounds where the operations of the nurseryman in the various methods of stratification, budding and grafting are illustrated in a practical manner. A considerable area is devoted each year to the growing of vegetables and variety tests of the leading types are made in connection with the Experiment Station work, thus affording ample opportunity for field study in the methods of culture practiced by the amateur and market gardener.

There is a forest plantation of about ten acres in which are growing a large number of the best varieties of deciduous trees for the northwest. A collection of over one thousand prepared sections of the American woods is used for illustrating the lec-
tures on forestry. The campus and shelter belts surrounding the college give ample opportunity for a study of the comparative value of native and foreign trees when used for windbreak and landscape effect.

The graduate who completes the course in Horticulture will find himself well equipped in the technique and applied principles of commercial horticulture. Fruit growing has become a specialized industry and success rewards the laborer in proportion as intelligent skill and perseverance are applied to the work, with a thorough understanding of the principles. Graduates who desire to pursue post-graduate work will find themselves well prepared to do so either at this or other institutions of like character.

Text books are used in each course when it is possible to do so advantageously. Lectures are given when it is necessary to enlarge or supplement the text. Particular stress is laid on laboratory instruction and the facilities and equipment are exceptionally good for this phase of the work. The following courses of study are offered:

**COURSE IN HORTICULTURE.**

**ACADEMIC YEAR.**

**FIRST TERM.**

- Algebra, 5
- English, 5
- History, 5
- Elocution, 2

**SECOND TERM.**

- Advanced Algebra and Plane Geometry, 5
- Elementary Botany, 2
- Elementary Rhetoric, 5
- History, 4
- Elocution, 1

**FRESHMAN YEAR.**

**FIRST TERM.**

- Live Stock and Score Card Practice, 2
- Market and Home Gardening, 2
- German, 5, or

(Mathematics, I.)
(English, I.)
(History, I.)
(Elocution, I.)

(Mathematics, XIII.)
(Botany, I.)
(English II.)
(History, II.)
(Elocution, II.)

(Animal Husbandry, I.)
(Horticulture, I.H.)
(Language, V.)
## DIVISION OF AGRICULTURE

1. **French, 5**
2. **Corn and Grain Judging, 5**
3. **Advanced Rhetoric, 5**
4. **History, Formative Period, 1**
5. **Military, 2**
6. **Library work, 4 hours.**

### SECOND TERM.

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<th>Course</th>
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<td>Live Stock and Score Card Practice, 2</td>
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<td>Plant Propagation, 3</td>
<td>(Horticulture, IIH.)</td>
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<td>Solid Geometry, 2</td>
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<td>German, 5, or</td>
<td>(Languages, VI.)</td>
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<td>French, 5</td>
<td>(Language, VI.)</td>
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<td>Field Crops, 5</td>
<td>(Agronomy, II.)</td>
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<td>Entomology, 2</td>
<td>(Zoology, I.)</td>
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### SOPHOMORE YEAR.

#### FIRST TERM.

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<td>Pomology, 3</td>
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<td>Botany, Ecology, 2</td>
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<td>Meteorology, 3</td>
<td>(Geology, I.)</td>
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<td>Farm Dairying, 2</td>
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<td>Composition, 1</td>
<td>(English, V.)</td>
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<tr>
<td>Military, 2</td>
<td>(Military, III.)</td>
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#### SECOND TERM.

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Plant Breeding and Field Work, 3</td>
<td>(Horticulture, IVH.)</td>
</tr>
<tr>
<td>Histology, 4</td>
<td>(Botany, III.)</td>
</tr>
<tr>
<td>Vegetable Cytology, 3 or 5, or</td>
<td>(Botany, XII.)</td>
</tr>
<tr>
<td>Systematic Botany, 3 or 5</td>
<td>(Botany, XV.)</td>
</tr>
<tr>
<td>Chemistry, 5</td>
<td>(Agricultural Chemistry, XXIII.)</td>
</tr>
<tr>
<td>Agricultural Geology, 3</td>
<td>(Geology, IX.)</td>
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<tr>
<td>Composition, 1</td>
<td>(English, VI.)</td>
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### JUNIOR YEAR.

#### FIRST TERM.

<table>
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<tr>
<th>Course</th>
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<tr>
<td>Advanced Pomology, 2</td>
<td>(Horticulture, VH.)</td>
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<tr>
<td>Economic Entomology, 5</td>
<td>(Zoology, IV.)</td>
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</table>
Chemistry, 4
Soils, 5

Elective.

Histology, 2
Physiology, 1
Analytical Geometry, 5
Photography, 2
Physical Laboratory, 1 or 2
Cryptogamic Botany, 4
Geology, 5
Political Economy, 5
Drama, 3
The Drama in Translation, 2
Debating, 1
Elocution 2
German, 5, or
French, 5
History, Mediaeval Institutions, 3
History, The French Revolution, 2
Military Science, 1

SECOND TERM.

Forestry, 3
Bacteriology, 2
Economic Botany, 2
Greenhouse Management, 4
Soils, 5

Elective.

Physiology, 1
Public Speaking, 1
Roads and Pavements, 2
Advanced Analytical Geometry, 3
Farm Crops, 5
Systematic Botany, 3 or 5
Mineralogy, 4
Finance, 3
Money and Banking, 2
Epic and Lyric Poetry, 5
Elocution, 2
French, 5, or
German, 5
Debating, 1
**Division of Agriculture**

History, Europe in the 16th, 17th and 18th Centuries, 3  
(History, VI.)

History, Europe since 1850, 2  
(History, XI.)

Military Science, 1  
(Military, VI.)

**Senior Year.**

**First Term.**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Landscape Gardening</td>
<td>Horticulture, VIIIH.</td>
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<tr>
<td>Research Work</td>
<td>Horticulture, IXH.</td>
</tr>
<tr>
<td>Advanced Entomology, 3 to 5</td>
<td>Zoology, IX.</td>
</tr>
<tr>
<td>Vegetable Pathology, 3 to 5</td>
<td>Botany, V.</td>
</tr>
<tr>
<td>Dairy Bacteriology, 3</td>
<td>Dairying, XVII.</td>
</tr>
<tr>
<td>Butter Making, 3</td>
<td>Dairying, XIV.</td>
</tr>
<tr>
<td>Comparative Physiology, 2</td>
<td>Veterinary Science, XXIII.</td>
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<tr>
<td>Farm Management, 5</td>
<td>Agronomy, VII.</td>
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<td>Agrostology, 2</td>
<td>Botany, XIII.</td>
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<td>Geology, 5</td>
<td>Geology, II.</td>
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<td>Political Economy, 3</td>
<td>Economic Science, III.</td>
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<td>History, Political Economy, 2</td>
<td>Economic Science, II.</td>
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<tr>
<td>Psychology, 5</td>
<td>Philosophy, I.</td>
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<tr>
<td>American Literature, 3</td>
<td>Literature, IV.</td>
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<td>The Short Story, 2</td>
<td>Literature, VI.</td>
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<tr>
<td>Evolution of Plants</td>
<td>Botany, XIX.</td>
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<tr>
<td>Advanced Crypt. Botany, 3</td>
<td>Botany, VI.</td>
</tr>
<tr>
<td>Elocution, 2</td>
<td>Elocution, V.</td>
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<tr>
<td>Oration, 1</td>
<td>Elocution, IX.</td>
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<tr>
<td>French, 4, or</td>
<td>Languages, III.</td>
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<tr>
<td>German, 4</td>
<td>Languages, VII.</td>
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<tr>
<td>History, Development of the United States, 3</td>
<td>History, III.</td>
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<tr>
<td>History, Reconstruction and the Constitution, 2</td>
<td>History, XII.</td>
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<tr>
<td>Chemistry, 5</td>
<td>Agricultural Chemistry, XXVII.</td>
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<tr>
<td>Military Science, 1</td>
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**Second Term.**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Literature of Horticulture, 2</td>
<td>Horticulture, XH.</td>
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<tr>
<td>Evolution of Cultivated Plants, 2</td>
<td>Horticulture, XIIH.</td>
</tr>
<tr>
<td>Vegetable Physiology, 2</td>
<td>Botany, XI.</td>
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<tr>
<td>Thesis, 2</td>
<td>Horticulture, XIIIH.</td>
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<tr>
<td>Elective.</td>
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<tr>
<td>Dairying, 3</td>
<td>Dairying, I.</td>
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<tr>
<td>Cheese Making, 3</td>
<td>Dairying, XV.</td>
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</table>
Comparative Physiology, 2  
Technology of Milk, 1  
Advanced Entomology, 3 to 5  
Calculus, 5  
Advanced Bacteriology, 3  
Geology, 5  
Ethics, 3  
Novel and Romance, 3  
The Essay, 2  
Elocution, 2  
History of Civilization, 3  
The Far Eastern Question, 2  
Astronomy, 5  
Chemistry, 5 (Agricultural Chemistry, XXXIV.)  
History—Individual Development of the United States. (———)  
Animal Nutrition, 5 (Animal Husbandry, IX.)  
Military Science, 1 (Military, VIII.)  
Rural Law, 1 (Civics, IV.)  

(Veterinary, XXIV.)  
(Dairying, XVI.)  
(Zoology, IX.)  
(Mathematics, IX.)  
(Botany, VIII.)  
(Geology, IV.)  
(Philosophy, II.)  
(Literature, III.)  
(Literature, VII.)  
(Elocution, VI.)  
(History, IV.)  
(History, IX.)  
(Physics, VIII.)

OUTLINE OF COURSES IN HORTICULTURE.

Course I.—Market and Home Gardening.—This course is a study of the small fruits and vegetables. It takes up the principles of culture, methods of harvesting and marketing, and the practical details of market and home gardening. Two recitations per week. First Term, Freshman. Mr. Merritt.

Course II.—Plant Propagation.—The course embraces a study of the principles of plant growth as affected by moisture, temperature, light and food supply. Propagation of plants by seedage, cuttage, layerage and graftage is studied. Laboratory work is given in the various methods of propagation, both in greenhouse and nursery. Two recitations and one laboratory period per week. Second Term, Freshman. Professor Erwin and Mr. Merritt.

Course III.—Pomology.—Under this head the principles which underly successful orcharding in the northwest, and the history and characteristics of the leading varieties of orchard fruits are studied. Score card practice is given, describing apples, plums, pears and grapes. Two recitations and one laboratory period per week. First Term, Sophomore. Professor Erwin and Mr. Little.
Course IVH.—Plant Breeding and Field Work.—The principles and history of plant breeding and its special application to horticulture are studied. The commercial nursery stocks, theory and practice in pruning, and a study of spraying machinery are included in this course. Two recitations and one laboratory each week. Second Term, Sophomore. Professor Erwin and Mr. Little.

Course VIH.—Advanced Pomology.—This is an advanced course in Pomology and is devoted to a study of varieties, their origin, history and synonyms. Special attention is given to important commercial types and to describing and judging fruit. One recitation and one laboratory. First Term, Junior. Mr. Little.

Course VIH.—Forestry.—The course embraces a study of forestry influences upon climate, rainfall and erosion. A systematic study is made of the native and introduced forest trees of economic importance. Three hours per week. Second Term, Junior. Professor Erwin.

Course VIIH.—Greenhouse Management.—This course includes a study of greenhouse construction and heating, a systematic study of the more important greenhouse plants and methods of culture; also the forcing of vegetables in both greenhouses and hot beds. Laboratory work embraces the practical details of propagating and caring for plants in the greenhouses. Two recitations and two laboratories per week. Second Term, Junior. Professor Erwin.

Course VIIIH.—Landscape Gardening.—The course embraces a study of the principles of landscape gardening, and a systematic study of the materials suitable for planting in Iowa for beautifying private and public grounds. Two hours. First Term, Senior. Professor Erwin.

Course IXH.—Research.—This course offers an opportunity for students to carry on a special line of investigation which is mapped out and carried on independently by the student under the supervision of the head of the department. Two hours. First Term, Senior. Professor Erwin.

Course XH.—Literature of Horticulture.—The course is designed to familiarize the students with ancient and modern writers on horticulture. Special attention is given to the writings of American authors and to current literature. Two hours. Second Term, Senior. Mr. Merritt.
Course XIIH.—Amateur Floriculture.—This course embraces a study of the propagation and general management of house plants, out door flower beds and ornamental shrubs. A systematic study of annuals, herbaceous perennials, bulbs, climbers and hot house plants is also included in the course. Two hours per week. First Term, Junior. The course is an elective in General and Domestic Science Course only. Professor Erwin.

Course XIIIH.—Evolution of Cultivated Plants.—The course is a study of the origin and amelioration of the important horticultural plants, including fruits, flowers and vegetables. Two hours. Second Term, Senior. Professor Erwin.

Course XIVH.—Thesis.—A subject shall be chosen under the direction of the head of the department, which shall require original work of investigation. After the subject has been thoroughly investigated a complete write up of the results must be made. All required courses in horticulture except those given in second term senior are prerequisites of this course. A subject for investigation may be chosen for Course IX. and the work continued in Course XIII. Two hours credit for the second term, Senior year, will be given for this course. Professor Erwin.

Graduate Work.

The department of horticulture offers graduate work along four distinct lines:

Pomology.—The orchards of the department, which contain over two hundred and fifty varieties of apples, one hundred and fifty varieties of plums, and fifty varieties of cherries, furnish abundant material for the specialist who desires to make a comparative study of varieties. In addition to this, the department possesses the private library of Charles Downing and his unpublished manuscript notes and descriptions; also several hundred catalogued descriptions of fruit that have been made in the last few years in the department.

Plant Breeding.—For many years systematic plant breeding has been carried on by the department. The results of this work can be seen in all stages from the young plants just starting to grow to those that have been fruiting or flowering for many years. The department each year carries on extensive work in plant breeding in connection with the State Horticultural Society which offers exceptional opportunity for study and field
experience by the specialist. The department is equipped with incubators, microscopes and other apparatus for laboratory investigations.

Greenhouse Work.—The greenhouses of the department give exceptional opportunity for investigation along this line. The department has five thousand square feet under glass, divided into eight different houses which are devoted to the growing of flowers, vegetables, and plant breeding experiments. Opportunity is offered for investigation in greenhouse management, propagation of plants and a study of the insect and fungus enemies of greenhouse plants.

Forestry.—Iowa, being a prairie state, presents many new and unsolved problems of tree growth, such as adaptation of species to the varying soil and climatic conditions, influence of wind breaks and shelter belts, and the comparative rate of growth of the different species. Upon and adjoining the college grounds are groves of evergreen and deciduous trees of varying ages which provide facilities for investigation along this line. The department has in its museum forestry specimens representing one thousand species. The department is also co-operating with the United States Weather Bureau in the investigation of the influence of windbreaks upon climate.

DEPARTMENT OF DAIRYING.

GEO. L. M'KAY, PROFESSOR.
F. W. BOUSKA, INSTRUCTOR IN DAIRY BACTERIOLOGY.
C. LARSEN AND F. HANSEN, INSTRUCTORS.

The magnitude and rapidly changing conditions of the dairy industry render a higher degree of skill and intelligence in this field imperative. No branch of education has proven more popular or productive of better results than the instruction furnished in the economical production of a superior class of dairy products. From the fertile farming lands of the Central West annually come one hundred or more young men to be trained in special work in our dairy school. That these young men become leaders wherever they take up work is shown by the responsible positions they are holding at high salaries in dairy communities everywhere, and the many prizes won in state and national conventions. Even the city milk supply business is calling for scientifically trained men who thoroughly understand the essential regulations for proper sanitation and cleanliness, pasteurization and sterilization.
Course I.—*Dairy Practice.*—This consists of five to seven hours of practical work in buttermaking per day. First term of one year course. In the second term of the year course it includes practical work in cheesemaking. Prof. McKay and Mr. Hansen.

Course II.—*Buttermaking.*—This course is a 1 hour study in the first term of the year course, and also in the four months' course. It includes a study of the composition of milk and dairy products, the principles of gravity and centrifugal separation of cream, a consideration of the principles of cream ripening, preparation of starters, churning, and the preparation of butter for the market. Prof. McKay and Mr. Hansen.

Course III.—*Milk Testing.*—1 hour, first term of year course, and also in the four months course. It includes a thorough study of the Babcock test for dairy products, with special attention for overcoming difficulties arising from varying conditions. The tests (Farrington's and Mann's) for determining the acidity of cream and milk, and the use of the lactometer for detecting adulterations, are included. Also composite sampling and testing of individual cows. Mr. Larsen.

Course IV.—*Dairy Machinery.*—(Farm Mechanics XII). 2 hours per week, first term of year course and during the four months course. Instruction is given for firing boilers by the most economical methods, the construction and operation of engines and pumps, and the placing of machinery, shafting and piping. Prof Zintheo.

Course V.—*Book Keeping.*—This course is designed to give the students the best form of bookkeeping for the business of the factory. 1 hour a week, 2nd term year course.

Course VI.—*Dairy Bacteriology.*—This course of twenty lectures is for students in the short dairy courses. The application of bacteriological knowledge in the care of milk, in buttermaking, and in cheesemaking, is taught in a simple and practical manner. This course cannot be substituted for Course XVII. in the Four Year Dairy Course. Mr. Bouska.

Course VII.—*Breeding and Judging Dairy Stock.*—(Animal Husbandry).—In this course the judging of dairy stock with the score card and by comparison, is made a leading feature, while the lectures relate mostly to the principles, methods and practice of breeding dairy stock and their improvement. It is a two
hour study during the first term of the year course, and during the four month's course. Prof Kennedy.

Course VIII.—Cheesemaking.—This study is given during the second term of the 1 year course. Sixteen lectures are given, and in addition to this six lectures on fancy brands of cheese, including Limburger, Brick, Swiss, Roquefort, Sage, Stilton, Pineapple and Gouda. Prof McKay.

Course IX.—Scoring Butter and Cheese.—These lectures are designed to give the student a correct idea of the standard market requirements for dairy products. Butter and cheese are examined and scored by the students, and their judgment compared with that of the instructor. In addition to this ten lectures are given during the second term to one year students. Prof McKay.

Course X.—Feeding Dairy Stock.—(Animal Husbandry).—Second term, 1 year course. Special attention is given in this course to the principles of feeding animals for the most economical production, with the composition and use of various feeding materials, and the feeding of dairy cows, including the influence of various feeding stuffs on the quantity, quality and composition of milk, butter and cheese. Mr. __________

Course XI.—Dairy Chemistry—(Chemistry)—The chemical composition and methods of analysis of dairy products is considered in a general manner. The adulterations of butter, cheese and milk are also taken up in the lectures. It is given in sixteen lecturers in the second term of the one year course. Mr. __________

Course XII.—Farm Dairying.—This is a required study for all four year agricultural students. First term Sophomore year. Optional study in course for women. Two class recitations per week and five laboratory demonstrations. The class work takes up the composition and secretion of milk, separation of milk by gravity and centrifugal force, the Babcock test for the determination of fat, preparation of starters, ripening of cream, and churning and packing of butter. As this course has been planned to give the students a knowledge of dairying in general, only five laboratory periods will be involved. The working of the Babcock test, detecting adulteration of milk, testing for acidity, and buttermaking as practiced in the best modern dairies, will be taken up and demonstrated in the laboratory. Mr. Larsen.
Course XIII.—Milk Testing.—This includes a thorough study in the use of the Babcock test for dairy products, with special attention to overcoming the difficulties resulting from varying conditions. The tests (Farrington's and Mann's) for determining acidity of cream and milk, and the use of the lactometer for detecting adulterations, are included. Also composite sampling and testing of individual cows, and the influences and detection of different preservatives and adulterants. It consists of two recitation per week and one laboratory. Sophomore year, Second Semester. Mr. Larsen.

Course XIV.—Buttermaking.—This course consists of (3) three recitations and one laboratory per week. It comprises a detailed and thorough study of the physical and chemical properties of milk and its components. It takes up the secretion and composition of milk, principles of separation of cream by gravity and centrifugal separators; effects of different degrees of acidity of cream upon the quality of butter and the principles of churning, packing and marketing of butter. The laboratory periods are devoted to practical work in the creamery. How to operate the leading types of separators and churns and how to prepare tubs and butter so as to procure the best keeping qualities of it, are some of the subjects which will receive special attention in the laboratory. Junior year, First Semester. Mr. Larsen.

Course XV.—Cheesemaking.—This course involves 1 recitation and 2 laboratory periods per week. The class work takes up the importance of the quality and composition of milk as it relates to the manufacture of Cheddar cheese. The principles involved in cutting, heating, milling, salting and pressing the curd curing and marketing. The influence of organized and unorganized ferments in the making and curing of cheese; the ventilation and construction of cheese curing rooms are also taken up. 2nd Semester, Sophomore year. Prof McKay.

Course XVI.—Technology of Milk.—Second term Junior year, 1 hour study. The course is intended to give the students a general knowledge of the different ways in which milk and its products are utilized outside of the scope ordinarily considered under dairying. Such subjects as the preparation of condensed, certified, modified and hygienic milk. It also includes the study of the food value of milk and its products, in comparison with other common foods, preparation and utilization of milk sugar and casein. Mr. Larsen.
COURSE XVII.—Dairy Bacteriology, Fall Term, 4 hours.—Two lectures and two laboratories per week are given on this subject. The students taking this course are presumed to have a knowledge of chemistry and general bacteriology. The lectures take up the function of bacteria and the application of bacteriological principles in dairy processes. The object of the laboratory work is to familiarize the student with a few typical dairy fermentations, and to train him in the use of laboratory methods. Mr. Bouska.

COURSE XVIII.—Scoring Butter and Cheese, First Term, Senior Year, 1 hour study.—The lectures are designed to give students a correct idea of the standard market requirements for dairy products. Butter and cheese are examined and scored by the students, and their judgment compared with that of the instructor. Prof. McKay.

COURSE XIX.—Research Work, First Term, Senior Year, 2 hours a week.—This course has been planned for the advanced students in Dairying. It consists of looking up recent work done on dairy subjects by the experiment stations. Also to read and study the different books on dairying, written by various authorities on assigned topics. Mr. Larsen.

COURSE XX.—Factory Management, Second Term, Senior year a 4 hour study.—This course, together with the knowledge the student already has is intended to qualify a student to superintend or manage any large factory or dairy establishment. It consists of two lectures per week and work in the creamery equivalent to two laboratory periods per week. The class work will include such subjects as the location and construction of creameries, drainage and ventilation of factories, how to treat the skim-milk and other by-products in order to get the best economic results. It is advisable for the student to put in the laboratory work during vacation, or some other time when the work can be done during consecutive days. Mr. Larsen.

COURSE XXI.—Preparation of Ice Cream and Ices.—This course consists of lectures and laboratory work both. They are combined in such a way as to give the student the best understanding possible concerning the preparation of ice cream, sherbets and ices, as made on a private and commercial scale. Senior year, Second Semester, 1 hour study. Mr. Larsen.

COURSE XXII.—Milk Inspection, Spring Term, two hours.—Sixteen lectures and sixteen laboratories are devoted to this
study. In the economical phase of the subject is, taught the use of the Babcock test and the lactometer in detecting watered or skimmed milk. Under the sanitary phase come infectious diseases carried by milk and the detection of preservatives. The legal aspect of such work is also considered.

Course XXIII.—Thesis.—The work on thesis must be original work on some dairy subject. The students should consult the professor in charge concerning their subject before or after the beginning of the senior year. The bacterial and chemical laboratory facilities, in connection with the creamery plant, offer special inducements to the students for doing original work. Frequently arrangements can be made with the department for co-operation in working out important subjects, and if the work is deemed meritorious, it will be published in bulletin form. The thesis work must represent time equivalent to a two hour study during the Second Semester of the Senior year. Prof. McKay.

Course XXIV.—Making of Fancy Cheese—One lecture and two laboratories per week. Second term Junior. This course takes up the making of those varieties commonly found in the American market, namely, Limburger, Brick, Swiss, Roquefort, Sage, Stilton, Pineapple, Gouda, Gorgonzola, and Neuchatel.

Graduate Course in Dairying.

This department is especially equipped to offer graduate work to advanced students in dairying. In connection with the creamery, which is in operation the whole year, there is in the same building a well equipped laboratory for dairy chemistry, as well as for dairy bacteriology. Opportunities for original investigational work in dairying are offered in the following lines:

Dairy Bacteriology.

For graduate work in dairy bacteriology, a knowledge of general bacteriology and chemistry is required, and a reading knowledge of German is recommended. Work can be done on the following phases of the subject:

I. Economic.
   1. In Milk and Cream: Methods of milking, care of milk, and preservation of milk.
   2. In Manufacturing Processes:
      (a) Buttermaking: Cream ripening and starters.
(b) Cheesemaking: Ripening of milk, starters, quality of different makes of cheese.
(c) Manufacture of Process Butter and Oleomargarine.

3. In Derivatives of Milk, i.e., finished products:
   (a) Butter: Pasteurized, raw cream, washed and unwashed.
   (b) Cheese: Effect upon curing and quality.

II. Sanitary.
   1. Fermentations producing poisonous substances in dairy products.
   2. Transmission of diseases by dairy products.

III. Technical.
Devising and testing of methods in dairy bacteriology.

DAIRY RESEARCH.

Under this heading investigations relating to the several subjects mentioned below in creamery work are included:

I. Receiving and Sampling Milk and Cream.
   The extensive use of hand separators throughout the West, and the receiving of hand separator cream, gravity cream, and whole milk at one creamery plant have given rise to several interesting practical questions in connection with receiving and sampling of the above mentioned dairy products. Degree of Economy in Grading different Qualities of Cream and Milk; Shall the Cream Patrons receive more per Pound of Fat than the Whole Milk Patrons, and if so, How Much? Different Methods of sampling Cream and milk, and Comparative Studies of the Degree of Efficiency and Economy in the Use of the Different Preservatives for Composite Samples, are some of the subjects, which can be worked out by students, under the above heading.

II. Milk Testing.
   This embraces a comparative study of the different tests for dairy products, viz: Gravimetric, Babcock, Gerber, Oil Test and the Space system. The testing for adulteration of milk is studied from two standpoints, (1), from the standpoint of detecting adulterations made with a view of defrauding buyers and consumers, and, (2), with a view of detecting adulterations that affect the health of people, when added to dairy products. This latter includes the different preservatives.
III. Separation and Pasteurization of Cream and Milk.

Such subjects as, Pasteurization of Different Qualities of Cream and Milk; If Pasteurization is Employed, shall it be Done Before or After Separation; Degree of Economy in Pasteurization; Different Methods of Pasteurization, and Comparative Studies of Different Types of Separators, are some of the most important ones which can be studied under the above heading.

IV. Cream Ripening.

A comparative Study of Different Ripening Temperatures; How May Different Qualities of Cream be Treated in order to Obtain the Best Ripening Results; How Much, and What Kind of Starters Shall be Used for Different Qualities of Cream, and Quick Ripening vs. Slow Ripening, are some of the phases of cream ripening which can be taken up advantageously.

V. Churning, Washing, Salting and Working Butter.

In connection with this topic a large number of important subjects for investigation, which bear directly upon the commercial value of butter, could be mentioned. Among them are, Effects of Richness of Cream; Temperature, and Different Amounts of Churning upon Quality and Quantity of Butter; Economic Aspect of Brine Salting versus Dry Salting under Different Conditions; Amount of Salt to use for Storage under and for Butter which is to be Used Shortly After Its Manufacture; Effects of Different Qualities of Water Used for Butter Washing, and Extent and Different Methods of Working.

VI. Packing and Marketing of Butter.

Subjects which can be included under this heading are, Which is the Most Economical Way of Placing Butter on the Market; A Comparative Study of Different Methods of Treating Tubs for Prevention of Molds, and What are the Losses Sustained from Printing the Butter at Different Degrees of Firmness.

The above mentioned subjects are not comprehensive in their scope. They can be modified or changed to include more or less, as the occasion demands.

FACTORY MANAGEMENT.

As a whole this subject is intended to embody the conditions, outside of buttermaking proper, which are to be considered in order to obtain the greatest possible degree of
economy in the operation of a large dairy or some large factory. Among some of the subjects may be mentioned, Organization of Creameries; Location, Drainage, Ventilation and Construction of Creamery and Dairy Buildings; Mechanical versus Natural Ice Refrigeration; Different Methods of Utilizing the Various By-Products in Creameries, and how to avoid the many losses so incidental to creamery management.

MILK PRODUCTION.

The work along this line is facilitated by reason of having in connection a large herd of cows. Subjects, such as the Greatest Economic Production of Milk with Special Reference to Individuality and Breeds of Cows; The Effect of Different Feeds Upon the Quality of Dairy Products, and the Environmental Conditions Affecting the Quantity and Quality of Milk, are included.

CHEESE MAKING.

In this course is offered advanced work in the manufacture of Cheddar cheese. The chemical and bacterial laboratories are open for research work to students pursuing work in this course. The College creamery has rooms and special facilities for the different steps in the manufacture and curing of cheese.

In order to meet the demands of such instruction, the Dairy School provides two sixteen weeks courses; one for butter, and one for cheese making, beginning with the regular college terms, and a one year course beginning with the college year. Also a two weeks course in sarters and cream ripening, especially designed for experienced makers, commencing January 4, 1904.

The College Creamery is in operation the year round. The work is conducted on a practical and commercial scale, as well as for scientific investigation and instruction. The product made invariably brings the highest quotations and has attained an enviable reputation in the markets of the United States and England.

The facilities for teaching dairying in a thoroughly practical and scientific manner are unexcelled. The building is exceptionally well equipped for practical work as well as scientific instruction and investigation. It is more than a "dairy building" as the term is generally understood. It is a practical working creamery and cheese factory, in operation every work day in the year. During the summer season, from five to ten thousand pounds of
milk are taken in daily, and manufactured into butter and cheese; during the winter somewhat less. The milk is purchased from farmers living in the vicinity of the College and they are paid for it according to its merits, based not only on butter fat determined by the Babcock test, but upon inspection of its cleanliness, freedom from all taints, objectionable odors, and other general qualities. A bacteriological laboratory, forms facilities for instruction and investigation in this important feature of the subject.

The student becomes familiar with everything connected with the management of a commercial creamery, and meets every problem that is likely to confront him in his afterwork. All leading types of separators are used in the dairy building and the most approved machinery is used throughout by the students.

The work done in dairying by the students in the four years course in agriculture is outlined in the course of study. They not only become familiar with the work in the creamery, the cheese factory and the private dairy, but study the underlying principles of the whole subject in the broadest sense. The College dairy herd, consisting of thirty or forty cows, regularly in milk, affords opportunity for the study of dairy as well as creamery, problems. These cows are milked and cared for mainly by student help under the direction of instructors.

During the latter part of the senior year, those students who have shown themselves capable, are permitted to spend a portion of their time in the laboratory in original work, and meritorious work of this kind is reported in the bulletins of the Experiment Station.

The courses in dairying were established for the benefit of those who were already engaged in the business, either on the farm or in the creamery or factory, and for this reason a very large portion of the time is devoted to practical work in the dairy building.

Students in these courses are taught everything connected with practical work, from weighing the milk brought in by the different patrons, and testing the same, to running the engine, scrubbing the floors and shipping the butter. The aim is to teach not only how to do all the work incidental to a business of this kind, but also why,—the reason,—the work should be done in the manner taught. The studies, other than dairying proper, which appear in the courses outlined are such as are necessary to a correct understanding of the principles involved, and all students entering these courses are required to attend them regularly.

Students in all of the Dairy and Creamery work are required to provide themselves with white suits, keep them clean and in good order.
## DIVISION OF AGRICULTURE

### DAIRYING.

#### ACADEMIC YEAR.

**FIRST TERM.**

<table>
<thead>
<tr>
<th>Subject</th>
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#### SECOND TERM.

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<td>Elementary Rhetoric, 5</td>
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#### FRESHMAN YEAR.

**FIRST TERM.**

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<td>(Animal Husbandry, I.)</td>
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<tr>
<td>Market and Home Gardening, 2</td>
<td>(Horticulture, II.)</td>
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<td>German, 5, or</td>
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<td>Corn and Grain judging, 5</td>
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<td>History, Formative Period, 1</td>
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<td>Advanced Rhetoric, 5</td>
<td>(English, III.)</td>
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**SECOND TERM.**

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<tr>
<td>Plant Propagation and Small Fruits, 3</td>
<td>(Horticulture, II.)</td>
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<td>Solid Geometry, 2</td>
<td>(Mathematics, XVII.)</td>
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<td>French, 5</td>
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<td>Farm Crops, 5</td>
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<td>Entomology, 2</td>
<td>(Zoology, I.)</td>
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SOPHOMORE YEAR.

FIRST TERM.

Live Stock and Score Card Practice, 3 (Animal Husbandry, III.)
Pomology, 3 (Horticulture, IIIH.)
Chemistry, 5 (Agricultural Chemistry, XXI.)
Farm Dairying, 2 (Dairying, XII.)
Farm Mechanics, 5 (Agronomy, III.)
Botany, Ecology, 2 (Botany, II.)
Composition, 1 (English, V.)
Military, 2 (Military, III.)

SECOND TERM.

Live Stock and Score Card Practice, 4 (Animal Husbandry, IV.)
Chemistry, 5 (Agricultural Chemistry, XXIII.)
Cheesemaking, 3 (Dairying, XV)
Milk Testing, 3 (Dairying, XIII)
Composition, 1 (English, VI)
Military, 2 (Military, IV.)
Bacteriology, 2 (Botany, VII.)

JUNIOR YEAR.

FIRST TERM.

Buttermaking, 4 (Dairying, XIV)
Principles of Breeding, 2 (Animal Husbandry, VIII.)
Chemistry, 4 (Agricultural Chemistry, XXV.)
Histology, 2 (Veterinary Science XXXIII.)
Comparative Physiology, 1 (Veterinary Science, XXI.)
Physiography, 3 (Geology, I.)
Shop Work, 1 (Mechanical Engineering, XXXVIII.)
Analytical Geometry, 5 (Mathematics, VIII.)
Surveying, 4 (Civil Engineering, VIII.)
Photography, 2 (Physics, IX.)
Physical Laboratory, 1 or 2 (Physics, XIV.)
Advanced Cryptogamic Botany, 3 (Botany, VI.)
Economic Botany, 2 (Botany, X.)
Economic Entomology, 5 (Zoology, IV.)
Geology, 5 (Geology, II.)
Political Economy, 5 (Economic Science, I.)
Drama, 3 (Literature, I.)
DIVISION OF AGRICULTURE

The Drama in Translation, 2 (Literature, VII.)
English Literature, 3 (Literature, I.)
Debating, 1 (English, VIII.)
Elocution, 2 (Elocution, III.)
Latin, 5, or (Latin, I.)
German, 5 (Languages, V.)
History, 16th, 17th & 18th Centuries, 3 (History, V.)
History, The Renaissance, 2 (History, X)
Military Science, 1 (Military, VI.)

SECOND TERM.

Fancy Cheesemaking, 3 (Dairying, XXIV.)
Technology of Milk, 1 (Dairying, XVI.)
Live Stock Management, 2 (Animal Husbandry, V.)
Chemistry, 4 (Agricultural Chemistry, XXVI.)

Elective.

Animal By-Products & Hand Books, 2 (Animal Husbandry, VII)
Farm Mechanics, 5 (Agronomy, IV)
Rural Law, 1 (Agronomy, IV)
Comparative Physiology, 2 (Veterinary Science, XXI.)
Public Speaking, 1 (Elocution, VIII.)
Roads and Pavements, 2 (Civil Engineering, XIII.)
Advanced Analytical Geometry, 3 (Mathematics, XI.)
Vegetable Cytology, 3 or 5 (Botany, XII.)
Systematic Botany, 3 or 5 (Botany, XV.)
Histology, 4 (Botany, III.)
Mineralogy, 4 (Geology, VI.)
Finance, 3 (Economic Science, V.)
Epic and Lyric Poetry, 5 (Literature, II.)
English Literature, 5 (Literature, II.)
Elocution, 2 (Elocution, IV.)
French, 5, or (Languages, II.)
German, 5 (Languages, VI.)
Debating, 1 (English, VIII.)
History, The French Revolution & XIXth cent. 3 (History, VI)
History, Constitutional Hist. of England, 2 (History, XI)
Military Science, 1 (Military, V)

SENIOR YEAR.

FIRST TERM.

Dairy Bacteriology, 3 (Dairying, XVII.)
Scoring Butter and Cheese, 1 (Dairying, XVIII.)
Research Work, 2 (Dairying, XIX.)
Elective.

Comparative Physiology, 2  (Veterinary Science, XXIII.)
Advanced Entomology, 3 to 5  (Zoology, IX.)
Agrostology, 2  (Botany, XIII.)
Evolution of Plants, 1  (Botany, XIX.)
Geology, 5  (Geology, II.)
Political Economy, 3  (Economic Science, III.)
History of Political Economy, 2  (Economic Science, II.)
Psychology, 5  (Philosophy, I.)
American Literature, 3  (Literature, IV.)
The Short Story, 2  (Literature, VI.)
Elocution, 2  (Elocution, V.)
Oration, 1  (Elocution IX.)
French, 4, or  (Languages, III.)
German, 4  (Languages, VII.)
History, The Formation of the Union, 3  (History, III)
History, The Diplomatic Hist. of U. S., 2  (History, XII)
Chemistry, 5  (Agricultural Chemistry, XXXIV.)
Military Science, 1  (Military, VII.)
Advanced Live Stock & Score Card Practice, 2  (Animal Husbandry, VI)

SECOND TERM.

Factory Management, 4  (Dairying, XX.)
Preparation of Ice Cream and Ices, 1  (Dairying, XXI.)
Animal Nutrition, 5  (Animal Husbandry, IX.)
Sanitary Science, 2  (Veterinary Science, XLV.)
Thesis, 2  (Dairying, XXIII.)

Elective.

Comparative Physiology, 2  (Veterinary Science, XXIV.)
Dairying, 3  (Dairying, I.)
Advanced Entomology, 3 or 5  (Zoology, IX.)
Calculus, 5  (Mathematics, IX.)
Advanced Bacteriology, 3  (Botany, VIII.)
Geology, 5  (Geology, IV.)
Ethics, 3  (Philosophy, II.)
Novel and Romance, 3  (Literature, III.)
The Essay, 2  (Literature, VII.)
Elocution, 2  (Elocution, VI.)
History, Division and Reunion, 3  (History, IV)
The Far Eastern Question, 2  (History, IX.)
Astronomy, 5  (Physics, VIII.)
Chemistry, 5  (Agricultural Chemistry, XXXIV.)
History, Ind. Deve. of the U. S.  (Military, VIII.)
Military Science, 1  (Military, VIII.)
ONE YEAR COURSE IN DAIRYING.

The one year course in dairying is designed to meet the wants of those who wish to acquire an intimate knowledge of practical dairy methods and the underlying principles as well as to the sciences related thereto. This course runs through one college year beginning in January and ending in December. Students completing this course will receive certificates, but the right is reserved to withhold such certificates until satisfactory evidence is furnished of ability to successfully manage commercial creameries or other large dairy establishments for at least one year. No other certificates will be given for any course in dairying except to students entitled to a diploma for the four years' course in Agriculture. (See note at bottom of page). Following is the course of study pursued:

FIRST TERM OF NINETEEN WEEKS.

Dairy Practice in butter making, 6 days per week.—(Dairy I.)
Buttermaking, 16 Lectures.—(Dairy II.)
Milk Testing, 16 Lectures.—(Dairy III.)
Dairy Machinery, 16 Lectures.—(Dairy IV.)
Book-keeping, 16 Lectures.—(Dairy V.)
Bacteriology of milk, 20 Lectures.—(Dairy VI.)
Breeding and Judging Dairy Stock, 30 lectures.—(Dairy VII.).

SECOND TERM OF SIXTEEN WEEKS.

Preparation of Ice Cream and Ices, 10 lectures.—Dairy XXI.).
Dairy Practice, 6 days per week,—(Dairy I.).
Cheesemaking, 16 lectures.—(Dairy VIII.).
Technology of Milk, 16 Lectures.—(Dairy XVI.)
Feeding Dairy Stock, 20 lectures.—(Dairy X.).
Dairy Chemistry, 16 lectures.—(Dairy XI.).
Scoring Butter and Cheese, 10 Lectures.—(Dairy IX.)
Factory Management, 10 lectures.—(Dairy XX.)

THE ONE TERM COURSE IN DAIRYING.

While we earnestly advise those who expect to work in dairy lines, either on the farm or in the creamery or factory to take the one year course in Dairying as outlined above we realize that there are many who for various reasons are unable to do this.
Believing that a state institution should offer every possible encouragement to those who desire to fit themselves to do their chosen work in the best manner, a Summer School in Dairying is thrown open to students. This school begins in January and continues sixteen weeks. The same studies are pursued in this as in the One Year Course:

XXI.)
Preparation of Ice Cream and Ices, 10 lectures.—(Dairy)
Dairy Practice, 6 days per week.—(Dairy I.)
Cheesemaking, 16 Lectures.—(Dairy VIII.)
Technology of Milk, 16 Lectures.—(Dairy IX.)
Feeding Dairy Stock, 20 Lectures.—(Dairy X.)
Dairy Chemistry, 16 Lectures.—(Dairy XI.)
Scoring Butter and Cheese, 10 Lectures.—(Dairy XII.)
Factory Management, 10 lectures, (Dairy XX.).

TWO WEEKS COURSE IN DAIRYING.

The prominent rank attained by students of the Iowa Dairy School in state and national contests has led to a demand for special instruction. The short course will begin January 4, 1904, and continue for two weeks. The subjects that will receive special attention during this time are: (Preparation of commercial and natural starters, ripening of cream, judging and scoring of cream and butter, and how best to treat the hand separator cream). This latter subject was a special feature of our last year's course. Hand separator cream will be shipped in to the College Creamery during this course, and treated in different ways with a view of making the best possible quality of butter from a given quality of cream. No one but experienced buttermakers will be admitted to this course. The fees for this course are $12.00, which is intended to cover expenses involved in securing extra instructors, and material for the instruction.
DEPARTMENT OF ANIMAL HUSBANDRY.

WILLARD J. KENNEDY, PROFESSOR.
W. J. RUTHERFORD, ASSISTANT PROFESSOR.
WAYNE DINSMORE, INSTRUCTOR.
W. W. SMITH, ASSISTANT.
J. A. CONOVER, GRADUATE ASSISTANT.

JOHN GOSLING, KANSAS CITY, MO., NON-RESIDENT LECTURER.

The department of Animal Husbandry stands for all lines of work which pertains to the judging, selecting, breeding, feeding, development, and care and management of the various breeds and classes of domesticated animals. Because of the importance of the live stock industry to the welfare of the state, and, on account of the unusual quest from students for instruction along this line, nothing within our power has been left undone to make the equipment for instruction purposes complete in every detail.

The herds and flocks were very carefully established at an early date. From time to time valuable additions in keeping with modern ideas have been made until, at the present time, almost every recognized market class of animal and good representatives of all the recognized breeds are available for the purpose of instruction. An equipment of this kind places us in a position to do work along Animal Husbandry lines which cannot be accomplished in those institutions where proper specimens of stock are not furnished. We are firmly convinced that there is but one way to make a young man a proficient judge of live stock, and that is by training his eye. In all of the lecture and laboratory work outlined in our courses the work is demonstrated by the use of living specimens.

The offices and lecture rooms of the department are located on the first floor of Agricultural Hall. The museum, which contains a complete assortment of the various kinds of wool, woolen materials, animal by-products, etc., is located on the third floor of the same building.

The judging pavilions are located near the barns. In this respect we are most fortunate in having two excellent, commodious judging pavilions. This allows us to divide our classes, which have in the past been unusually large, into many sections, thus affording an excellent opportunity for individual work.
These buildings are well lighted and heated, and are arranged in every way for the convenience and comfort of those who take the work.

An excellent collection of horses representing all the market classes and the breeds of both light and heavy types is maintained for instruction purposes. Among these are good representatives of the Shires, Percherons, Clydesdales, French Coachers, Hackneys, Standard breeds, and American Saddle Horses. Some of the horses are imported; while the others have been purchased with much care in their selection, from the best breeders on the continent.

More than two hundred head of cattle, representing all the leading beef, dual purpose, and dairy breeds are maintained on the farm. Complete breeding herds of most of the breeds are kept. A large herd of Galloway cows, kept for cross-breeding purposes, is used in the production of blue greys. An excellent collection of steers, representing the highest type of fat steer, and all the other grades and classes to be found on our leading markets down to the very lowest grades, is always available for class work. This affords our students an excellent opportunity to study the market demands and to know what constitutes each class, also why there is such a wide margin in the prices paid for cattle by the packer.

The equipment of the sheep department is especially strong, constituting over two hundred head, containing good representatives of the mutton and wool types and typical specimens of all the leading breeds. Eight distinct breeds, which have been carefully selected to represent the type and characteristics of each breed both in regard to their mutton form and wool bearing qualities, are always available for class-room work. In addition to the breeding flocks we always have a choice collection of fat wethers which affords an excellent opportunity for the student to familiarize himself with the highest type of finished mutton sheep.

In the swine department, representatives of six breeds are maintained, including the best American as well as the leading British varieties. As in the other departments, the aim in this has been to keep in touch with the modern ideas of the leading breeders, both in regard to breeding and the type of the animals in these breeds. At all seasons of the year there is more or less feeding of market stock being done on the farm and in con-
nection with the Experiment Station, so that excellent material is always available for instruction purposes regarding the qualities that add to the value of stock for the ordinary market. Having pure bred representatives, it is easy to inform the student in a practical way on the finer points of color, type, and other characteristics that relate to the pure bred classes of stock.

To assist farther in this work, the herd books of the different American and foreign registry associations are being constantly added to the library. Through these the student is not only enabled to inform himself in regard to pedigrees, but he is enabled also through them to study the different scales of points which the breeders have adopted to represent the highest types of the various breeds.

Other features of the equipment are photographs, charts and lantern slides; these are used in the lecture room when it is not possible to illustrate with the living animal. It is the aim of the department to illustrate all lines of instruction with living representatives. The abundant material available from the herds and flocks is freely drawn upon and used extensively in all lectures and score card practice. By means of score cards prepared by the department, the students are brought in close contact with the animals, and through them are informed on the points of market merit desirable in ordinary stock; while later the use of the official scale of points for the different breeds in a similar way, makes them skilful in judging representatives of the different breeds.

As soon as the student is familiar with the use of the score card, comparative judging is introduced. In comparative judging from four to six animals are used, and each student is required to place all the animals in order of merit, and write down clearly and concisely on a blank folder, prepared especially for this work, full reasons for making his awards. This kind of work teaches the student to compare animals and to balance the weak and the strong points of each in making his final awards. As soon as the student demonstrates his ability to place classes well, herd groups and sweepstake classes are introduced during his Senior year's work. This kind of work is similar to the most difficult judging done at our leading state fairs and international expositions. As soon as the student shows that he possesses the qualifications needed to judge stock in the show ring, he is sent out, in answer to the many requests from the secre-
taries, to judge various classes of stock at county fairs. This in connection with his college work, results in establishing the lessons learned in the class room.

**COURSE IN ANIMAL HUSBANDRY.**

**ACADEMIC YEAR.**

**FIRST TERM.**

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**SECOND TERM.**

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<td>Elementary Rhetoric</td>
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**FRESHMAN YEAR.**

**FIRST TERM.**

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<td>Corn and Grain Judging</td>
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SOPHOMORE YEAR.

FIRST TERM.

Live Stock and Score Card Practice, 4 (Animal Husbandry, III.)
Farm Mechanics, 5 (Agronomy, III.)
Invertebrate Zoology, 4 (Zoology, II.)
Chemistry, 5 (Agricultural Chemistry, XXI.)
Composition, 1 (English, V.)
Botany, Ecology, 2 (Botany, II.)
Military, 2 (Military, III.)

SECOND TERM.

Live Stock and Score Card Practice, 4 (Animal Husbandry, IV.)
Farm Mechanics, 5 (Agronomy, IV.)
Invertebrate Zoology, 4 (Zoology, III.)
Chemistry, 5 (Agricultural Chemistry, XXIII.)
Composition, 1 (English, VI.)
Military, 2 (Military, IV.)

JUNIOR YEAR.

FIRST TERM.

Principles of Breeding, 2 (Animal Husbandry, VIII.)
Chemistry, 4 (Agricultural Chemistry, XXV.)
Farm Dairying, 2 (Dairying, I.)
Embryology, 3 (Zoology, V.)
Soils, 5 (Agronomy, V.)

Elective.

Pomology, 3 (Horticulture IIIH.)
Histology, 2 (Veterinary Science, XXXIII.)
Comparative Physiology, 1 (Veterinary Science, XXI.)
Physiography, 3 (Geology, I.)
Analytical Geometry, 5 (Mathematics, VIII.)
Surveying, 4 (Civil Engineering, VIII.)
Photographs, 2 (Physics, IX.)
Physical Laboratory, 1 or 2 (Physics, XIV.)
Cryptogamic Botany, 4 (Botany, IV.)
Economic Botany, 2 (Botany, X.)
Economic Entomology, 5 (Zoology, IV.)
Geology, 5 (Geology, II.)
Political Economy, 5 (Economic Science, I.)
Drama, 3 (Literature, I.)
The Drama Translation, 2
Debating, 1
Elocution, 2
French, 5 or
German, 5
History, Mediaeval Institutions, 3
History, The French Revolution, 2
Military Science, 1

SECOND TERM.

Live Stock Management, 4
Animal Parasites, 2
Soils, 5
Chemistry, 4

Elective.

Forestry, 3
Comparative Physiology, 1
Bacteriology, 2
Public Speaking, 1
Roads and Pavements, 2
Advanced Analytical Geometry, 3
Vegetable Cytology, 3 or 5
Systematic Botany, 3 or 5
Histology, 4
Mineralogy, 4
Finance, 3
Money and Banking, 2
English Literature, 5
Elocution, 2
French, 5, or
German, 5
Debating, 1
History, Europe in the 16th, 17th, and 18th Centuries, 3

Rural Law
History, Europe since 1850. 2
Military Science, 1

SENIOR YEAR.

FIRST TERM.

Advanced Live Stock and Score Card Practice, 2
Anatomy of Domestic Animals, 2  (Veterinary Science, LV.)
Obstetrics, 1  (Veterinary Science, XIX.)
Sanitary Science, 2,  (Veterinary Science, XLIV.)
Farm Management, 5  (Agronomy, VII.)

Elective.

Dairy Bacteriology, 3  (Dairying, XVII.)
Butter Making, 3  (Dairying, XIV.)
Comparative Physiology, 2  (Veterinary Science, XXIII.)
Vegetable Pathology, 2 or 5  (Botany, V.)
Advanced Entomology, 3 or 5  (Zoology, IX.)
Agrostology, 2  (Botany, XIII.)
Chemistry, 4  (Agricultural Chemistry, XXVIII.)
Evolution of Plants, 1  (Botany, XIX.)
Geology, 5  (Geology, II.)
History Political Economy, 2  (Economic Science, II.)
Political Economy, 3  (Economic Science, III.)
Psychology, 5  (Philosophy, I.)
American Literature, 3  (Literature, IV.)
The Short Story, 2  (Literature, VI.)
Elocution, 2  (Elocution, V.)
Oration, 1  (Elocution, IX.)
French, 4, or German, 4  (Languages, III.)
History, Development of the United States, 3  (History, III.)
History, Reconstruction and the Constitution, 2  (History, XII.)
Landscape Gardening, 2  (Horticulture, VIII.)
Military Science, 1  (Military, VII.)
Chemistry, 5  (Agricultural Chemistry, XXVII.)

SECOND TERM.

Animal By-Products and Herd Books, 2 (Animal Husbandry, VII.)
Horse Shoeing, 2  (Veterinary Science, XVI.)
Conformation and Soundness, 2  (Veterinary Science, XVII.)
Animal Nutrition, 5  (Animal Husbandry, IX.)
Evolution of Animals, 1  (Zoology, VI.)

Elective.

Chemistry, 4  (Agricultural Chemistry, XXXIV.)
Dairying, 3  (Dairying, I.)
Cheese Making, 3  (Dairying, XV.)
Technology of Milk, 1  (Dairying, XVI.)
Evolution of Cultivated Plants, 1
Advanced Entomology, 3 or 5
Comparative Physiology, 2
Calculus, 5
Advanced Bacteriology, 3
Vegetable Physiology, 2 or 5
Geology, 5
Ethics, 3
Novel and Romance, 3
The Essay, 2
Elocution, 2
History of Civilization, 3
The Far Eastern Question, 2
Astronomy, 5
Chemistry, 5 (Agricultural Chemistry, XXXIV.)

The following courses of study are given in Animal Husbandry:

Course I.—Market Types—Cattle and Sheep—First Term. Freshman Year. This course covers the judging of the different market classes of cattle (beef and dual purpose), and sheep (mutton and wool). Judging two 2-hour periods per week. Professor Rutherford, Mr. Dinsmore, and Mr. Smith.

Course II.—Market Types—Dairy Cattle—Horses and Swine. —Second Term. Freshman Year. This course covers the judging of the different market classes of dairy cattle of horses (light and heavy), and swine (bacon and fat). Judging two 2-hours periods per week. Professor Rutherford, Mr. Dinsmore and Mr. Smith.

Course III.—Breed Types—Cattle and Sheep—First Term. Sophomore Year. This course covers the judging of representatives of the different breeds according to their official standards; also a study of their origin, history and characteristics and adaptability to different conditions of climate and soil. Lectures two 1-hour periods per week. Judging two 2-hour periods per week. Professor Rutherford, Mr. Dinsmore, and Mr. Smith.

Course IV.—Breed Types—Dairy Cattle—Horses and Swine. —Second Term. Sophomore Year. This course covers the judging of representatives of the different breeds according to their official standards; also a study of their origin, history and char-
acteristics, and adaptability to different conditions of climate and soil. Lectures two 1-hour periods per week. Judging two 2-hour periods per week. Professor Rutherford, Mr. Dinsmore, and Mr. Smith.

COURSE V.—Live Stock Management.—The housing, feeding, care and management of the various classes of live stock. Lectures four 1-hour periods per week. Professor Rutherford and Mr. Dinsmore.

COURSE VI.—Advanced Stock Judging.—First Term. Senior Year. This course covers horses, cattle, sheep and swine, especial attention being paid to the judging of groups of animals similar to county and state fair work. Judging two 2-hour periods per week. This course is intended for students specializing in Animal Husbandry. Professors Kennedy and Rutherford.

COURSE VII.—Animal By-Products and Herd Book Study.—Second Term. Senior Year. This course covers a critical study of animal by-products, as designated by the leading packing establishments, first half of term. Second half of term is devoted to the careful study of pedigrees of the leading families of the various breeds of live stock. Two 1-hour periods per week. Professor Rutherford.

COURSE VIII.—Principles of Breeding.—First Term. Junior Year. This course embraces a study of the principles of breeding, including selection, heredity, atavism, variation, fecundity, with the presentation of the methods of breeding, in-and-in breeding, cross breeding, etc., and a historical study of their results. In addition, the several features relating to the higher breeding of pure bred stock are made the subject of study and investigation. Two 1-hour periods per week. Professor Curtiss.

COURSE IX.—Animal Nutrition.—Second Term. Senior Year. This course includes anatomy and physiology of the digestive system, the purpose of nutrition, the theory and practical economy of rations for growth, fattening, milk or maintenance; sanitation of feeds, and hygiene of the farm. Five 1-hour periods per week. Professor Kennedy.

COURSE X.—Thesis and Investigation Work.—Senior Year. Upon lines to be arranged with the head of the department according to the nature of the subject. Professors Kennedy and Rutherford.

SPECIAL COURSES.

Students desiring shorter courses of study will be permitted
to take up special courses in any line of work offered providing they comply with the full requirements for admission to short course work as outlined elsewhere in this catalog. They must also have credits for all necessary work preparatory to the taking of such courses as are demanded of the regular men in the four year course.

WINTER COURSE IN STOCK JUDGING.

In response to a widespread demand for special short course instruction in the judging and feeding of animals, a two weeks' course has been established during the winter vacation. This course will begin January 3, 1905, and continue for two weeks and will be devoted exclusively to score card practice, and judging of horses, cattle, sheep, and hogs, and lectures on feeding the same.

In this work special attention will be given to the selection of animals best suited for feeding purposes. Good specimens of the highest type of fat steer and ideal representatives of all the various breeds will be used for class work. At the conclusion of the cattle work a slaughter test and block demonstration of the various market types of steers will be conducted under the supervision of John Gosling, Kansas City, Missouri. This course is intended especially for the man on the farm that cannot avail himself of the opportunity to take a complete course.

A special course in corn judging will be given at the same time and the work will be so arranged that all those present may take both lines of work.

To cover in part the expense of securing additional help and stock for demonstration a tuition fee of $2.00 will be charged for admission to this course, but one fee will cover the instruction in both grain and stock judging.

CLAY, ROBINSON & CO. FELLOWSHIP PRIZES.

Clay, Robinson & Co., Live Stock Commission Merchants, Union Stock Yards, Chicago, offer, annually, $1,000.00 in prizes to be awarded to the Agricultural Colleges making the best exhibit of live stock at the International Live Stock Exposition held at Chicago in December of each year. They stipulate that the money won by the various colleges shall be used for the establishment of fellowship prizes to be awarded to graduate students in the department of Animal Husbandry. These fellowships, amounting to $300.00 per student annually, are granted by
the Board of Trustees upon the recommendation of the dean of the Division of Agriculture and the head of the department. A student holding a fellowship may pursue post-graduate work in Animal Husbandry.

GRADUATE COURSES.

We are now in a position to offer post-graduate work along five distinct lines. Students to be eligible to take this work must comply with the College requirements for post-graduate work as stated elsewhere in this catalog.

(a). Animal Nutrition. We have excellent facilities for advanced research work along this line on account of the vast amount of work done on the College farm, and on the Cook farm at Odebolt, Iowa, along the lines of horse, cattle, sheep, and swine feeding experiments. We have, annually, over one thousand animals in feeding experiments under our direct supervision. Students desiring special research work along this line may do the same under the direction of the head of the Department.

(b). Animal Breeding. A special line of research work has been outlined for students desiring special work pertaining to underlying principles of animal breeding. Special experiments are being conducted on the farm along new and original lines.

(c). Study of Breeds. Our large collection of pure bred animals representing almost every recognized breed of live stock on the continent affords us excellent opportunities for special work along these lines. We have not only typical specimens, but, in most instances, we have complete breeding herds, thus there is an excellent opportunity to study the adaptability of each breed to Iowa conditions.

(d). Stock Judging. We have unusual facilities for thorough work along this line. All of the various market types of animals are available, also good representatives of all the pure breeds. Animals are carefully examined on foot, then slaughtered for a block test and the exact percentages of the various cuts with their values are ascertained.

(e). Practical Management of Stock. This course will include an exhaustive study and investigation of the methods in vogue on the best managed stock farms and breeding establishments in the United States, Canada, Great Britain, and other countries, and is intended especially for those students who are preparing to manage stock farms.
POSITIONS OPEN TO MEN TRAINED ALONG ANIMAL HUSBANDRY LINES.

The demand for competent young men, thoroughly trained along the lines of practical and scientific animal husbandry work, by far exceeds the supply. We are constantly in receipt of inquiries for men combining college training with practical experience and natural ability. There appears to be no limit to this demand at a compensation not exceeded in any other calling. Our course is so arranged that our students have an excellent opportunity to combine practical and scientific knowledge. A few of the many lines of work open to graduates of this department are: College and Experiment Station work, Agricultural journalism, Managers of stock farms, Salesmen with commission merchants, Buyers for the packing houses at the many stock yard centers, Salesmen of animal feed stuffs manufactured by the packing houses, Glucose companies, Linseed and Cotton seed oil companies, etc., etc. At the present time we have not nearly enough good men to fill the positions open to graduates.

SCIENCE AND AGRICULTURE.

The field of Agriculture is undergoing such rapid changes and there is such wide and varied demand for men combining agricultural and scientific training that it has been deemed advisable to add a course rather less technical than the four preceding courses that relate directly to these special lines of agriculture. This course is designed to meet the demands of County Agricultural High Schools and other institutions, public and private, established for the purpose of giving instruction in the general sciences, and elementary instruction in agriculture. The introduction of agriculture into the rural schools has received a marked impetus during the past few years. There will doubtless arise a large demand for strong, broadly educated, well trained teachers for this and other kinds of agricultural instruction in public and preparatory schools.

COURSE IN SCIENCE AND AGRICULTURE

ACADEMIC YEAR.

FIRST TERM.

Algebra, 5
English, 5

(Mathematics, I.)
(English, I.)
DIVISION OF AGRICULTURE

History, 5
Elocution, 2

SECOND TERM.
Advanced Algebra and Plane Geometry, 5 (Mathematics, XIII.)
Elementary Botany, 2 (Botany, I.)
Elementary Rhetoric, 5 (English, II.)
History, 4 (History, II.)
Elocution, 1 (Public Speaking, II.)

FRESHMAN YEAR.

FIRST TERM.
Live Stock and Score Card Practice, 2 (Animal Husbandry, I.)
Market and Home Gardening, 2 (Horticulture, I.)
German, 5 or French, 5 (Language, V.)
Advanced Rhetoric, 5 (Language, I.)
History, Formative Period, 1 (History, XVII.)
Military, 2 (Military, I.)
Library Work, 4 hours (Military, II.)

SECOND TERM.
Live Stock and Score Card Practice, 2 (Animal Husbandry, II.)
Plant Propagation and Small Fruits, 3 (Horticulture, IIIH.)
Solid Geometry and Trigonometry, 5 (Mathematics, VI.)
German, 5 or French, 5 (Language, VI.)
Composition, 1 (Language, II.)
Entomology, 2 (English, IV.)
History, The American Nation, 1 (History, XVIII.)
Military, 2 (Military, II.)

SOPHOMORE YEAR.

FIRST TERM.
Pomology, 3 (Horticulture, IIIH.)
Botany, Ecology, 2 (Botany, II.)
Chemistry, 5 (Agricultural Chemistry, XXI.)
Meteorology, 3 (Geology, I.)
Farm Dairying, 2 (Dairying, XII.)
Farm Mechanics, 5 (Agronomy, II.)
Composition, 1 (English, V.)
Military, 2 (Military, III.)

SECOND TERM.
Histology, 4 (Botany, III.)
Systematic Botany, 3 to 5 (Botany, XV.)
Forestry, 3 (Horticulture, VIH.)
Chemistry, 5
Composition, 1
Military, 2

(Agricultural Chemistry, XXVII.)
(English, VI.)
(Military, IV.)

JUNIOR YEAR.

FIRST TERM.

Chemistry, 4
Soils, 5

(Agricultural Chemistry, XXV.)
(Agronomy, V.)

Elective.

Advanced Pomology, 2
Economic Entomology, 5
Vertebrate Zoology, 4 or 5,
Vertebrate Zoology, 4 or 5
Principles of Breeding, 2
Histology, 2
Physiology, 1
Shop Work, 1
Analytical Geometry, 5
Surveying, 4
Photography, 2
Physical Laboratory, 1 or 2
Cryptogamic Botany, 4
Geology, 5
Political Economy, 5
Drama, 3
The Drama in Translation, 2
Debating, 1
Elocution, 2
German, 5, or
French, 5
History, The 16th, 17th, and 18th centuries, 3
History, The Reinaissance, 2
Military Science, 1

(Animal Husbandry, VIII.)
(Zoology, IV.)
(Zoology, II.)
(Zoology, II.)
(Horticulture, VH.)
(Zoology, IV.)
(Zoology, II.)
(Veterinary Science, XXXII.)
(Veterinary Science, XXI.)
(Mechanical Engineering, XXXVIII.)
(Mathematics, VIII.)
(Civil Engineering, VIII.)
(Physics, IX.)
(Physics, XIV.)
(Botany, IV.)
(Geology, II.)
(Economic Science, I.)
(Literature, I.)
(Literature, VIII.)
(English, VII.)
(Public Speaking, III.)
(Language, V.)
(Language, I.)
(History, V.)
(History, X.)
(Military, VI.)

JUNIOR YEAR.

SECOND TERM.

Forestry, 3
Bacteriology, 2
Soils, 5

(Horticulture, VI.)
(Botany, VII.)
(Agronomy, VI.)
DIVISION OF AGRICULTURE

**Elective.**

- Economic Botany, 2
- Vegetable Cytology, 3 to 5
- Invertebrate Zoology, 4 or 5
- Embryology, 3
- Greenhouse Management, 4
- Chemistry, 4
- Physiology, 1
- Public Speaking, 1
- Roads and Pavements, 2
- Calculus, 3
- Rural Law, 1
- Farm Crops, 5
- Systematic Botany, 3 to 5
- Mineralogy, 4
- Finance, 3
- Money and Banking, 2
- Epic and Lyric Poetry, 5
- Elocution, 2
- French, 5, or
- German, 5
- Debating, 1
- History, The French Revolution and to XIX cent., 3
- History, The Constitutional History of Eng., 2
- Military Science, 1

**SENIOR YEAR.**

**FIRST TERM.**

- Landscape Gardening, 2
- Vegetable Pathology, 3 to 5
- Advanced Entomology, 3 to 5
- Research Work, 2
- Chemistry, 4
- Dairy Bacteriology, 3
- Butter Making, 3
- Comparative Physiology, 2
- Farm Management, 5
- Agrostology, 2
- Geology, 5

**Elective.**

- (Botany, X.)
- (Botany, X.)
- (Zoology, III.)
- (Zoology, V.)
- (Horticulture, VII.)
- (Agricultural Chemistry, XXVI.)
- (Veterinary Science, XXII.)
- (Public Speaking, VIII.)
- (Civil Engineering, XIII.)
- (Mathematics, XI.)
- (Agronomy, IV.)
- (Botany, XV.)
- (Geology, VI.)
- (Economic Science, V.)
- (Economic Science, V.)
- (Literature, II.)
- (Public Speaking, IV.)
- (Languages, II.)
- (Languages, VI.)
- (English, VIII.)
- (Horticulture, VIIIH.)
- (Botany, V.)
- (Zoology, IX.)
- (Horticulture, IXH)
- (Agricultural Chemistry, XXVII.)
- (Dairying, XVII.)
- (Dairying, XIV.)
- (Veterinary Science, XXIII.)
- (Agronomy, VII.)
- (Botany, XVII.)
- (Geology, II.)
Political Economy, 3
History, Political Economy, 2
Psychology, 5
American Literature, 3
Public Speaking, 2
Oration, 1
French, 4 or German, 4
History, The Formation of the Union, 3
Advanced Cryptogamic Botany, 3
History, Diplomatic History of the U.S., 2
Evolution of Plants, 1
Military Science, 1

(Economic Science, III.)
(Economic Science, II.)
(Psychology, III.)
(Literature, IV.)
(Public Speaking, V)
(Public Speaking, IX.)
(Languages, III.)
(Languages, VII.)

(SENIOR YEAR.

SECOND TERM.

Evolution of Cultivated Plants, 2
Vegetable Physiology, 2
Thesis, 2

Elective.

Chemistry, 4
Evolution of Animals, 1
Animal Nutrition, 5
Dairying, 3
Cheese Making, 3
Comparative Physiology, 2
Technology of Milk, 1
Advanced Entomology, 3 to 5
Calculus, 5
Advanced Bacteriology, 3
Geology, 5
Novel and Romance, 3
The Essay, 2
Public Speaking, 2
History, Division and Reunion, 3
The Far Eastern Question, 2
Astronomy, 5
History, Industrial Development of the United States.
Military Science, 1

(Horticulture XIIH.)
(Botany, XI.)
(Agricultural Chemistry, XXXIV.)
(Zoology, VI.)
(Animal Husbandry, IX.)
(Dairying.)
(Dairying, XV.)
(Veterinary, XXIV.)
(Dairying XVI.)
(Zoology, IX.)
(Mathematics, IX.)
(Botany, VIII.)
(Geology, IV.)
(Literature, III.)
(Literature, VII.)
(Public Speaking, VI.)
(History, IV.)
(History, IX.)
(Physics, VIII.)
(Military, VIII.)
The aim of the work in Agricultural Chemistry is twofold; namely, to give the student a fundamental knowledge of chemistry, and then to apply this knowledge to the chemical problems of agriculture.

A sufficient amount of time during the first year and a half of study is applied to the acquiring of chemical principles and relations, yet at the same time the application of these facts is considered and constitutes a portion of the work. In other words the study of the science of chemistry accompanies its application to agricultural questions. The later work of the courses is principally devoted to applied chemistry.

The courses open to the undergraduate student are briefly described as follows:

Course XXI.—Elementary Experimental Chemistry.—This is the introductory work for the students in the agricultural courses and is intended to give knowledge of matter by actual handling and experience with it. The recitations are upon the laboratory work for the purpose of obtaining a first-hand knowledge of chemical changes. The student learns how, and the necessity for taking notes of useful data, how to interpret these facts and apply them to common chemical changes that are going on in nature. The course includes a study of the so-called non-metallic elements that are present in the air and soils, etc. There are three recitations and two afternoons of laboratory practice per week. First Term, Sophomore Year.

Course XXIII.—This course is a continuation of Course XXI, dealing with the metallic elements and their relation to those studied in the preceding term. In this course the student becomes acquainted with the basic elements in the soil and their relations to non-metallic compounds, i. e., the acids and their place in the formations of salts. He learns how to separate and recognize these elements, their compounds, preparatory to determining them quantitatively. Three recitations and two afternoons of laboratory work are required each week. Second Term, Sophomore Year.

Course XXV.—Organic Chemistry.—This course follows regularly Courses XXI and XXIII and deals with substances pro-
duced by animal and plant life. The laboratory study brings the student in touch with the properties and methods of preparing organic food material. The sugars, starches and proteids, the simpler food material will be studied and at the same time the fundamentals of organic chemistry will be required. The work is divided into two recitations and two laboratory periods per week, during the First Term, Junior Year.

Course XXVI.—Chemistry Applied to Agriculture.—This work will be introduced in the laboratory study by quantitative analysis of inorganic substances followed by analyses of soils, fertilizers and other inorganic substances related to agricultural processes. The recitation work, two hours per week, will follow the laboratory practice and be accompanied by text book and lecture study.

Course XXVII.—Chemistry Applied to Agriculture.—This course will consider in an elementary manner the organic phase of Agricultural Chemistry and will deal with the chemical changes in foods during digestion and assimilation, and the changes that occur in the plant and animal body. Some time will be devoted to dairy products and especially to the methods of analyzing such substances for adulteration. Laboratory practice will occupy two afternoons per week.

Course XXVIII.—Dairy Chemistry.—Lectures and laboratory practice. This course is for students in the one year course in dairying, and will be arranged to fit the needs and the preparation of such students, but it will be an elementary character throughout. First Term.

Course XXIX.—Continuation of Course XXVIII. Second Term.

Graduate Work in Agricultural Chemistry.

Advanced work in agricultural chemistry leading to the master's degree in scientific agriculture may be selected either as a major or minor study. This work may be taken in the chemical department as a continuation of the work begun as an undergraduate of this college or any other college of equal rank. Or the student may elect to do this work with the chemical section of the experiment station thus coming in touch with the research work and investigations being carried on there. The following courses of graduate work are offered:

Course I.—Chemistry of Soils.—This course embraces a
study in soil chemistry and its relation to plant life, including the chemical composition, its relation to fertility, the determination of available plant food, fertilizers and other substances which are effective in the production of crops, also the study of rain and drainage waters, the loss of plant food due to improper drainage and other conditions.

Course II.—Chemistry of Dairying.—This work will cover a general survey of the field of chemistry applied to dairy problems such as the composition and chemical changes of butter, milk and cheese, and also other oils and fats used as food products and for adulteration.

Course III.—Chemistry of Feeds.—This course includes a careful study of the chemistry of plants and field crops, such as the chemical composition of corn, wheat and oats, methods of modifying and improving the chemical composition by selection and plant breeding, chemical study of growing plants during the various stages of development, etc., the effects of various elements in the soil on the composition and quality and the yield or productiveness of the grain and forage crops. The study of the chemical composition and nutriments of the various refuse and by-products used for stock feeding.

Course IV.—Chemistry of Horticulture.—This course includes a careful study of the chemical composition of fruits including the influence of various elements present in the soil on the composition, quality and productiveness of the orchard, vineyard or garden; also the influence of climatic conditions upon the composition and quality of fruits, and the influence of selection and breeding.

Courses in Botany.

It is our aim in teaching botany to students in the various courses in agriculture to give them a fundamental knowledge of this science. The subject of botany is important in every phase of agricultural work. In agricultural operations it is important not only to know the plants and their products but also the diseases of plants caused by fungi. Millions of dollars are lost annually because of the destructive work of parasitic fungi. Some of the most important crops of the farmer such as corn, wheat, and oats are subject to many fungus diseases that can be prevented. A knowledge of how to combat the diseases
affecting these crops is of great importance. Many of the con-
tagious diseases of animals depend upon a knowledge of bacteri-
ology. A knowledge of the products of the farm such as grasses, 
clovers, and potato, from a botanical standpoint is important. It
is not necessary here to enumerate the various lines of botany
and its relation to agriculture, suffice it to say that the subject
is so important that botany occupies a very prominent place.
The department is well equipped to carry on the various phases
of the work. The courses in botany are grouped under the
following heads:

Course I.—Elementary Botany.—This embraces a study of
the morphology of flowering plants. The work covered is essenti-
ally that found in Leavitt's Lessons or Bergen's Botany. Credit
will not be given in this work in the college unless there is
evidence of having pursued laboratory work in the high school.

Course II.—Ecology.—In this course special attention is given
to the relation of plants and their environment, much time being
devoted to the pollination of flowers, especially of our economic
plants, and the dissemination of the plants, especially how our
weeds are scattered.

Course III.—Histology.—In this course the student studies
the minute structure of plants. In the lectures a discussion of
the cell, its parts and constituents, how cells multiply, tissue and
tissue systems. These subjects are studied in the light of mod-
ern investigations. Three lectures and one laboratory. Four
hours.

Course IV.—Cryptogamic Botany.—The first term of the
Sophomore year is devoted to the study of cryptogams from a
systematic standpoint. Special attention is given to "rusts," "smuts," and "mildews." The morphology and life history of
the different groups of cryptogams are considered. Lectures
and laboratory, with frequent excursions. Four hours.

Course V.—Vegetable Pathology.—In this course plant dis-
eases of the farm, garden and horticultural crops are taken up.
In this course, lectures on the more injurious of the fungus
diseases of cultivated plants are considered in a more extended
way than is possible in Course IV. The theory of immunity
and prevention of diseases, rotation of crops and fungicides
are considered. In this course the diseases are treated from the
standpoint of the host plant. First Term, Senior. Two or five hours.

Course VI.—Advanced Course in Cryptogamic Botany.—An advanced course in cryptogamic botany is given, especially with reference to the injurious fungi such as rusts, smuts, molds and mildews. Three hours.

Course VII.—Bacteriology.—Bacteriology bears an important relation to many different agricultural problems. In Course VII special attention is given to the technique of the subject, the making of media and the growing of ordinary saprophytic bacteria with special lectures on the diseases of animals and the classification of bacteria. Two hours.

Course VIII.—Advanced Bacteriology.—This is an elective study, special attention being given to the study of the more intimate relations of bacteria to agriculture, such as bacteria of the soil, water. Three hours.

Course IX.—Economic Botany.—In this course special attention is given to our cultivated plants, and especially to those used as food, such as cereals, clovers, etc. Lectures and laboratory work. Two hours.

Course X.—Vegetable Physiology.—A course of lectures with demonstrations on the functions of plants, nutrition, growth, movements and reproduction of higher plants. Lectures and recitations. Second Term, Senior Year. Two hours.

Course XI.—Vegetable Cytology, and Micro-technique.—A study of the cell, and its division in lower and higher plants. The use of reagents and satining, methods of sectioning and mounting. Recitation and laboratory work. Second Term, Senior year. Three hours.

Course XIII.—Agrostology.—This course is an elective one. It is intended to give the student a general idea of some of the more important grasses, not only with reference to their botanical position, but also with reference to their economic uses, especially meadow and pasture grasses; the cereal food products, grasses in medicine, grasses as soil binders, and grasses for lawn and lawn making. Lecture and laboratory work. First Term, Senior year. Two hours per week.

Course XIV.—Seeds and Seed Testing.—A short course embodying the principles of seed testing is given. The princi-
pal agricultural weed seeds and their detection in commercial seeds, as well as the structural characters of the more important commercial seeds are studied. The germinative energy of various seed and such other features as are important in connection with seed testing are considered. First Term, Senior year. Two hours.

COURSE XV.—General Systematic Phanerograms. — This course takes up a systematic study of Phanerogams. In the lectures, the sequence given in Engler's Syllabus is used, special attention being given the horticultural, dendrological and agricultural plants. In the laboratory the student becomes familiar with the more important of the plants taken up. Each plant is written up from the following view points: History, description, ecology, and economic value. Three hours.

COURSE XIX.—Evolution of Plants.—A course of lectures dealing with evolution as applied to plants, theories of evolution, heredity, origin of plant life, present and past distribution, Senior year, First Term. One hour.

AGRICULTURAL GEOLOGY.

COURSE IX.—Open to students in division of agriculture, Second Term, Sophomore Year, and counts three hours. The origin, mineralogy and physiography of soils with attendant problems are treated as fully as the time will permit. Dr. Beyer.

COMPARATIVE ANATOMY.

Prepared for students in Animal Husbandry (Veterinary Science, 55), and comprises lectures from models and prepared specimens, recitations and practical work in dissection. This course is given during the first term, Senior year. Dr. McNeall.

THE AGRICULTURAL CLUB.

A Students' Agricultural Club holds weekly meetings in Agricultural Hall for the consideration of current topics in agriculture. A students' reading room is also maintained there, and all the leading agricultural journals are kept on file for the use of agricultural students. The College Library contains an extensive list of agricultural and scientific publications to which students are referred for original research and study.

There are seven societies that hold their weekly meetings on Saturday evenings and serve to supplement the literary work of the college. All students are urged to join in the work of the Agricultural Club and advised to join one of the literary so-
cieties and to avail themselves of these other adjunct means of instruction. The faculty of clear and concise thinking and speaking is of incalculable value to the agricultural student.

**REMUNERATIVE AND INSTRUCTIVE LABOR.**

able work in the fields and about the barns and grounds, much compensation for services of this kind ranges from 8 to 15 cents per hour, according to the merit of the work. Students are thus able to earn from one-fourth to one-half their expenses and at the same time materially strengthen the practical side of their education. A number of the strongest and most capable students have been aided in finding employment during vacations with successful stockmen on good farms and in various other positions in line with their chosen lines of work. Some young men have preferred to take a year of practical work in this way during their course, and it has invariably proved of marked benefit and enabled them to command more desirable and remunerative positions at the completion of their college work. Too much emphasis cannot be placed on a thorough understanding of the practical application of correct principles in agriculture.

**SPECIAL COURSES.**

Students desiring shorter courses of study will be permitted to take up special courses in accordance with the general regulations governing such work and subject to the approval of the Dean of the Division of Agriculture and the President of the College.

Such courses may cover a period of one term, one year or two years, but special students are advised to take not less than one year's work in any chosen branch and in all cases where practicable or possible to do so, students are urged to complete the four years' course. The results will fully justify the time and expense required and modern agriculture demands thorough training, special fitness, and a high order of ability. No degrees are granted for less than four years' work.

**GRADUATE COURSES.**

Special facilities are offered for Graduate work in the following lines as described under the head of graduate work in the several departments:

1. Agronomy, major or minor in
   (a) Farm Crops.
   (b) Farm Mechanics.
2. Dairying.
   (a) Dairy Bacteriology.
   (b) Dairy Research.
   (c) Factory Management.
   (d) Cheese Making.
   (e) Milk Production.

   (a) Animal Nutrition.
   (b) Animal Breeding
   (c) Study of Breeds.
   (d) Stock Judging.
   (e) Practical Management of Stock.

4. Horticulture, major or minor in
   (a) Pomology.
   (b) Plant Breeding.
   (c) Greenhouse Work.
   (d) Forestry.

5 Agricultural Chemistry, major or minor in
   (a) Chemistry of Soils.
   (b) Chemistry of Dairying.
   (c) Chemistry of Fields.
   (d) Chemistry of Horticulture.

The four years' course leads to the degree of B. S A., Bachelor of Scientific Agriculture. Graduate Students are eligible for the degree of M. S. A., Master of Scientific Agriculture. This degree is granted only to students who have completed a four year course in this or some similar college and completed a two year graduate course in scientific and practical agriculture, one year of which must be resident work at this college. The work required for a post graduate degree is largely in the nature of personal research and investigation under the direction of professors in charge of the studies chosen.

CREDITS FOR PRACTICAL WORK.

Agricultural students who, by previous agreement with the head of the department, do practical work on farms, horticultural or feeding or breeding establishments, beet sugar factories or forestry reservations, of recognized standing, during their course of study will be allowed credits on the following basis: Students who take practical work of the kind described under the direc-
tion of the proprietor and render competent and faithful service, will, on their return to College and the presentation of a concise written report or resume of their observations and experience, be entitled to the following credits in the four year courses in Agriculture:

For three months, five hours of elective work in the Junior or Senior year; for six months, eight hours; and for one year, ten hours; no more than five hours of which shall be credited in any one term of the college course.

POSITIONS.

The demand for competent young men thoroughly trained in practical and scientific agriculture and dairying exceeds the supply. We are in constant receipt of inquiries for men combining college training with practical experience and natural ability. There appears to be no limit to the demand for the right kind of men and the compensation for such service is not exceeded in any other calling. In view of this demand for well trained men in the field of agriculture, students are urged to take a full four years' course, supplemented with extensive practical work and observation. To this end, a number of our best students have taken a term or a year out during their course on some of the best farms of this and other states; and many have secured employment during vacations in large dairy and horticultural establishments where the most valuable practical experience can be acquired. The importance of this feature of preparation cannot be overestimated and it is urged and recommended even where young men are entirely familiar with ordinary agricultural work. It enables the student to derive more benefit from his course in college and fits him for a better and more lucrative position after graduation.

DEPARTMENT OF AGRICULTURE SCHOLARSHIP.

The State Department of Agriculture offers a scholarship prize of $200.00, open to young men of the state not enrolled as a regular or special student in any agricultural college, without barring students of the special short courses in January. This scholarship is to be awarded for the best work in judging live stock and corn annually at the state fair in accordance with the rules and conditions prescribed by the state department of agriculture; by some additional special prizes, making the scholarship worth about $250.00.
EXPERIMENT STATION
EXPERIMENT STATION STAFF

A. B. STORMS, M. A., D. D.,
President

C. F. CURTISS, B. Sc., M. S. A.,
Director.

W. J. KENNEDY, B S A.,
Animal Husbandry and Vice Director.

A. T. ERWIN, M. Sc.,
Acting Horticulturist.

J. B. WEEMS, Ph. D.,
Chemist.

L. H. PAMMEL, B. Ag., M. Sc., Ph. D.,
Botanist.

H. E. SUMMERS, B. S.,
Entomologist.

CARL W. GAY, V. M. D.,
Veterinarian.

G. L. McKay,
Dairying.

P. G. HOLDEN, M. Sc., B. Pd.,
Agronomist.

W. H. STEVENS0N, A. B.,
Soils.

C. J. ZINTHEO, B. Sc.,
Farm Mechanics.

W. J. RUTHERFORD, B. S. A.,
Acting in Animal Husbandry.

E. E. LITTLE, B. S. A., M. S. A.,
Assistant in Horticulture.

W. H. OLIN, M. Sc.,
Assistant in Agromony.

F. W. BOUSKA, B. S. A.,
Dairy Bacteriology.

C. LARSEN, B. S. A.,
Assistant in Dairying.
The investigations of the Experiment Station have an intimate relation to the college work of instruction, as the problems occupying the attention of the Station are those that have a material bearing on the profit of the farm, and they are also those that are timely, and in need of accurate investigation. Whether relating to the field or the feed lot, the aim is to investigate those questions which will have a practical relation to successful agriculture. Originality is made a feature of the work so far as it is consistent with useful results, and in all instances the sole object is to throw light on the truth relating to the various principles and practices of the farm. The field work strongly supports the instruction of the College in regard to the varieties of grains and the method of cultivation, thus enabling the student to become acquainted with the latest ideas relating to these. Thorough tests are made of the different varieties of fodders, grasses and grains. In addition to this, complete trials, embodying various crops and systems of culture, are carried on extensively each year, with the hope of giving direction to the farm management that is best for Iowa.

The investigations with animals embrace a study of the value of different feeds for different features of animal production. The system of feeding, the preparation of different feeds are also made the subjects of investigation as far as it is thought they may be made a part of the methods of the Iowa farmer. Included with these, there have been a large number of trials with the different types of animals suitable for the requirements of the market. The object sought in this department of the Station work has been to indicate the manner in which the Iowa farmer through the employment of animals can realize the most from his farm products and add to the fertility of the farm. The Experi-
ment Station has reached out in this way to a remarkable degree, bringing sheep from Mexico, Colorado and Scotland, cattle from Texas and Great Britain, horses from Wyoming, Montana and Europe, in its endeavor to thoroughly study this very important feature of the farmer's work. The data from these experiments is always accessible to the student and he has the opportunity of daily observing the development of it at every stage.

The dairy industry is already indebted to the Experiment Station for doing much towards establishing it on a surer foundation of accurate knowledge. The Station has always kept in closest touch with those engaged in the various lines of the dairy industry. Some of the problems which practical men are constantly meeting and asking aid in solving, are at all times objects of experiment by the Dairy Section. The students have the advantage of seeing these experiments carried out, and in some cases assist in the work themselves. In this way they learn not only what are the chief problems to be solved but become informed on the methods employed in different lines of investigation. The experimental work that has been so far conducted, relates mainly to the various problems of buttermaking while lately features of cheesemaking have been made subjects of special study. The records of these are abundantly used in class work, together with the results from the later investigations in the newer field of bacteriology.

The Horticultural Department in its connection with the Experiment Station affords the student admirable opportunities for checking the theory of the class room against the practice of the field. The connection of the Department of Horticulture with the State Horticultural Society is such that problems touching the commercial side of fruit growing receive the closest attention. The field equipment of the Department is excellent, so that experiments in spraying for the prevention of fungous pests and injurious insects may be carried on under the eye of the student; this is true also of other phases of orchard routine, such as fertilizing, pruning and thinning. The experimental nursery work carried on is of decided educational value. In plant breeding, extensive experiments have been inaugurated and are still in progress. The Station work thus equips the student with the practice and technique necessary to a thorough horticultural training.
DIVISION OF VETERINARY SCIENCE.
FACULTY

ALBERT BOYNTON STORMS, A. M., D. D.,
President.

JOHN H. McNEIL, V. M. D.,
Dean of the Faculty and Professor of Anatomy and Principles and Practice of Surgery.

CARL W. GAY, D. V. M.,
Professor of Histology, Pathology and Meat Inspection.

M. JACOB, V. M. D.,
Professor of Veterinary Medicine and Sanitary Science.

WALTER A. STUHR, D. V. M.,
Assistant Professor of Physiology and Therapeutics.

WILBERT EUGENE HARRIMAN, B. Sc., M. D.,
Professor of Ophthalmology.

M. STALKER, M. Sc., V. S.,
Lecturer.

CHARLES F. CURTISS, B. Sc., M. S. A.,
Dean of Division of Agriculture.

W. J. KENNEDY, B. S. A.,
Professor of Animal Husbandry.

LOUIS HERMANN PAMMELL, B. Ag., M. Sc., Ph. D.,
Professor of Botany and Bacteriology.

HENRY ELIJAH SUMMERS, B. S.,
Professor of Zoology and Animal Parasites.

ALFRED ALLEN BENNETT, M. Sc.,
Professor of Chemistry.

GENERAL JAMES RUSH LINCOLN,
Professor Hippology, Military Science and Tactics.

WILLIAM JOHN RUTHERFORD, B. S. A.,
Assistant Professor of Animal Husbandry.

GEORGE JUDISCH,
Lecturer on Pharmacy.

C. G. LEE, B. S., LL. B.,
Lecturer on Veterinary Jurisprudence.
DIVISION OF VETERINARY SCIENCE

MISS LOLA PLACEWAY, B. Sc.,
Instructor in Chemistry.

FRANK WILLIAM BOUSKA, M. Sc. A.,
Instructor in Dairy Bacteriology.

JOSEPH E. GUTHRIE, M. Sc.,
Instructor in Zoology.

R. E. BUCHANAN,
Assistant Instructor of Botany and Poisonous Plants.

MISS EDNA KING,
Assistant in Bacteriology.

WAYNE DINSMORE,
Assistant in Animal Husbandry.

ANNOUNCEMENT.

A course in Veterinary Science was established as a Division of the Iowa State College of Agriculture and the Mechanic Arts twenty-three years ago, and was at that time, the only three year graded Veterinary Course in America. It has since been a potent factor in the development of Veterinary education.

In 1903 the course was extended to four years, of nine months each. Instruction is conducted on those lines which insure the graduation of Veterinarians best qualified to serve the live stock interests and the public health of this and other states.

Situated in the center of the greatest live stock state in the Union, from which it derives its support, and affiliated with an institution which is especially representative of the Agricultural interests of that state, the Division of Veterinary Science, of the Iowa State College, offers exceptional facilities to prospective Veterinary students.

FIELD OPEN TO QUALIFIED VETERINARIANS.

The student having completed the course of instruction outlined in this curriculum becomes a veterinarian in the broadest sense and competent to enter a wide field of usefulness by any of the avenues enumerated.

A.—General Practice.—In view of the fact that the National live stock valuation is estimated at $3,200,000,000, it becomes obvious that the graduate possessing fitness and aptitude for this kind of work will meet with a ready demand and substantial compensation for his services.
B.—Bureau of Animal Industry.—Veterinarians are in demand for inspection work in the Bureau of Animal Industry, United States Department of Agriculture, at salaries ranging from $1200 to $2500.

C.—Army.—The Veterinarians in the United States Army now have a position similar to that of a commissioned officer. The salary is $1,500 per year with a ten per cent increase for each five years' service up to twenty years with the same allowances as a second lieutenant of cavalry.

These positions are most desirable and with our insular possessions give opportunities for wide experience in professional work.

D.—Animal Husbandry.—Qualified veterinarians are called upon to act as counsel to the breeder and as guardians to the vast live stock industry of the nation.

E.—Municipal and State Veterinarians.

F.—Veterinarians to stock farms and corporation stables.

G.—Veterinarians to Experiment Stations and Instructors in Veterinary Colleges.

REQUIREMENTS FOR ADMISSION.

Candidates having a college degree, a teachers' first grade certificate, diploma from an accredited high school or those who have passed successfully the matriculate examination of a recognized college will be admitted without examination.

Other candidates for admission will be required, 1: To write legibly and correctly an essay of not less than two hundred words; 2: To pass a satisfactory examination in Arithmetic and in United States History, and to present other evidence of sufficient ability to follow with profit the instruction offered in the Veterinary course.

Graduates from recognized schools of Veterinary Science, Agriculture, Medicine, Dentistry or Pharmacy will be given credit for work pertaining to the course, upon the presentation to the faculty of satisfactory standing or upon passing an entrance examination.

REGISTRATION AND CLASSIFICATION.

Students are registered and classified by the Dean of the Veterinary Faculty.
A student's relation with the College may be discontinued at any time during his course, at the discretion of the Faculty. All students must enter in September of each year, except for advanced standings.

LENGTH OF TERMS AND YEAR.

The year is divided into two terms, one of 16 weeks and one of 20 weeks; making a school year of nine months.

The hospital and dissecting room are open during vacation, thus affording the student an opportunity to devote additional time to this work.

EXAMINATIONS AND DEGREE.

Examinations are held at the close of each term upon the work passed over during that term. At the end of each year the final examinations are held. Students must have passed examinations in all pre-requisite work of a given term or year before they can proceed with the work of the succeeding term or year. These examinations are controlled by the faculty rules. At the close of the course after passing a satisfactory examination, the student receives the degree of Doctor of Veterinary Medicine (D. V. M.).

Candidates for graduation must be twenty-one years of age, of good character and must have passed examinations in all the required subjects in the course.

MEMBERSHIP IN THE AMERICAN VETERINARY MEDICAL ASSOCIATION.

Graduates of this school are eligible to membership in the American Veterinary Medical Association.

VETERINARY MEDICAL SOCIETY.

The Veterinary Medical Society of the Iowa State College was organized by the students for the purpose of investigating and discussing subjects relating to Veterinary Science. All matriculate students of the four classes are members and the diploma of the society is conferred upon graduates.

EQUIPMENT.

The Veterinary Hospital and the daily free clinics furnish an abundance of material for practical work. Situated in an exten-
sive stock growing district, the College is especially favored in this respect, not only horses, but all species of animals, being brought to the hospital for treatment. Senior students are assigned cases for diagnosis and treatment under the supervision of the clinical professor, thus having an opportunity to apply the theoretical knowledge obtained in the class room. During the course opportunity is offered to witness all the different operations performed in veterinary surgery, together with the methods of treating the different internal diseases. Junior students are detailed in alphabetical order to assist the pharmacist in the compounding of prescriptions, in this way becoming familiar with the various forms in which medicines are administered. A detailed description of the various branches taught in the course is given on the succeeding pages.

The department occupies quarters in Agricultural Hall. In this building are offices for the veterinary members of the Faculty, two large lecture rooms for the use of the department, a laboratory and a museum.

The Veterinary Hospital is a substantial brick building three stories high, fitted with commodious, well lighted single and box stalls, operating room, office and pharmacy, resident surgeon's room, dissecting room, an elevator for the accommodation of the patients unable to use the runway to second floor, and is furnished with all the surgical instruments of modern construction, operating table and other important conveniences for hospital work. A number of fine grass paddocks directly adjacent to the hospital are used for such patients as are likely to be benefitted by out door exercise and a grass diet in the season.

A laboratory constituting part of the Experiment Station has recently been equipped. This laboratory is intended for the purpose of bacteriological and pathological investigation of the diseases of domestic animals. It is supplied with the most modern biological apparatus, such as high power microscopes, incubators, hot air and steam sterilizers, microtomes, stains, gas, water and electric light, and in fact all first class facilities for scientific investigation. Specimens are received frequently for examination. Students of the Veterinary Division may avail themselves of these facilities under the direction of the veterinarian in charge.

Aside from the facilities which belong especially to the Vet-
The equipment for instruction in Animal Husbandry is very complete.

These are fully described in the catalog under the Animal Husbandry Department.

The work in botany, chemistry, zoology and other related studies is adequately provided for in the special buildings for the accommodation of these several departments of college work.

**LIBRARY.**

The entire college library of about 15,000 volumes containing a good variety of veterinary and medical books and journals is open to the veterinary students.

**COURSES OF STUDY.**

**COMPARATIVE ANATOMY OF THE DOMESTIC ANIMALS.**

**DR. MCNEIL.**

This subject is studied through the entire Freshman and Sophomore years and embraces Descriptive and Practical Anatomy.

Descriptive Anatomy is taught by a series of lectures, including the study of the bones, articulations, muscles, circulatory apparatus, the nervous system, the respiratory system, the organs of digestion, the urino-genital apparatus and the organs of special sense. The lectures are supplemented by demonstrations from mounted skeletons, prepared specimens, charts and an Auzoux elastic model.

Practical Anatomy comprises a comprehensive and thorough course in dissection, which extends through the Freshman and Sophomore years. During each year the student is required to make two complete dissections of the horse and such parts of other animals as may be deemed necessary. Freshman students devote their time in the dissecting room to the study of the bones, articulations and muscles. Sophomore students make special dissection of the nervous system, circulatory apparatus, lymphatic glands, organs of special sense and the organs contained in the abdominal and thoracic cavities. The dissection is carried out in a systematic manner under the personal supervision and direction of the Professor of Anatomy. Each student is required to
properly dissect and pass an examination on the part assigned before passing to the dissection and study of another part.

The subject is taught in four courses, as follows:

Course I.—First term, Freshman year, three lectures each week.

Course II.—Second term, Freshman year, three lectures each week.

Course III.—First term, Sophomore year, three lectures each week.

Course IV.—Second term, Sophomore year, three lectures each week.

HISTOLOGY.

DR. GAY.

Histology proper is preceded by a short course in Microscopy. This is designed to give the students a working knowledge of the microscope and microscopical methods, thus fitting him to study, to best advantage, the minute structure of tissues and organs.

Instruction in Histology is conducted by recitations from a standard text, supplemented by a laboratory course.

Course XXXIII.—Treats of the cell as a unit of structure, and function, and the tissues, their classification and characteristics. First term, Freshman Year, one recitation and one laboratory per week.

Course XXXIV.—Treats of the above tissues in their relation to the structure of organs. Second term, Freshman Year, one recitation and one laboratory per week.

PHYSIOLOGY.

DR. STUHR.

Physiology is taught by the comparative method, the vital phenomena of the domesticated animals being compared with those of the human being and the common features pointed out. Special attention is given to the variations occurring in the functions and extends throughout the Freshman and Sophomore years.

Course XXI.—Higher forms of animal life are nothing more than mere association of the simpler organism, the modification of whose protoplasm leads to such specialization of function as characterizes the different tissues of the body.
It becomes necessary therefore to acquire some knowledge of the simplest expressions of these complex functions as manifested in the simpler organization. Thus general physiology deals with the animal cell, the unit of organization, its origin, modification of form and structure, chemical constitution and the various physical and chemical laws which influence its nutrition, growth, reproduction and development.

General physiology is taught throughout the Freshman year by a course of lectures one hour per week.

Course XXI.—This is a continuation of Course XXI throughout the second term of the Freshman year.

Course XXII.—The study of special physiology is begun in the first term of the Sophomore year and continued throughout the year. It deals more particularly with the special functions of the various organs and tissues of the body.

It is taught by two recitations per week.

Course XXIV.—The subject of physiology is continued in the second term of the Sophomore year.

F. Smith’s Manual of Veterinary Physiology is used as a text in these courses.

Pharmacy.

Mr. Judisch.

This subject is taken up in the first term of the Freshman year and continued throughout the year. It consists of lectures and laboratory work.

Course XXV.—All the official drugs and preparations are considered. Special attention is paid to practical pharmaceutical problems and manipulations. Each student is required to prepare at least one of each class of the official preparations. This course is given in the first term of the Freshman year and consists of one lecture and one laboratory exercise each week.

Course XXVI.—In the second term of the Freshman year one lecture and one laboratory exercise each week are devoted to the principles and practical work of the compounding of prescriptions.

Materia Medica.

This subject is taught throughout the Freshman year and is divided into two courses:

Course XXVII.—As an introduction to the study of Materia
Medica the student is first taught to familiarize himself with the definition and uses of such terms as he will encounter in his subsequent study of the subject.

The classification of drugs presented is that in accordance with their most dominant action and includes all such agents as are employed in the practice of Veterinary Therapeutics. Each drug is studied in detail, attention being called to the following characters: Official name, common name, origin, mode of preparation, description of properties, adulterations, incompatibles, names of therapeutic action and preparations in the official U. S. Pharmacopeia.

Samples of the various drugs and their preparations are exhibited as they are discussed in order that the student may become more firmly impressed with their leading characters. This course is taught by lectures one hour per week throughout the first term of the Freshman year.

Course XXVIII.—This is a continuation of Course XXVII and is carried throughout the second term of the Freshman year.

Therapeutics.

Dr. Stuhr.

This subject is presented by a course of lectures of one hour per week extending throughout the Sophomore and Junior years.

Course XXIX.—This is begun in the first term of the Sophomore year. The same classification of drugs is followed throughout these courses as was presented in Materia Medica. This work is simply carried on from that point where the study of materia medica ceases.

The work of this term is largely composed of such preliminary considerations as lead up to the subsequent study of therapeutics proper; thus the work is confined to the study of the modes of action of drugs, the physiological laws which govern the same, the absorption, elimination and methods of administration, dosage, idiosyncrasy, etc.

This work is supplemented by a course of lectures on prescription writing.

Course XXX.—The study of Therapeutics proper begins in the second term of the Sophomore year.
Each therapeutic agent is considered in detail and the following features brought out: The physiological and therapeutic actions, indications and contra-indications, toxicology and treatment, modes of administration and dose.

Course XXXI.—This is a continuation of Course XXX throughout the first term of the Junior year.

Course XXXII.—The subject is completed in the second term of the Junior year. Lectures dealing with general therapeutic measures are presented during the latter part of this term.

The entire course is supplemented by reading from standard works on the subject.

Winslow's "Veterinary Material Medica and Therapeutics" is used as a reference.

STRUCTURAL BOTANY.

Professor Pammel.

Course IX.—This course begins in the first term of the Freshman year. The work consists of recitations and lectures. The student is expected to become familiar with the morphology of flowering plants and the terms used in descriptive botany. In the study of identification and selection of drugs it is necessary to have a thorough botanical knowledge of general structural botany as well as vegetable histology. Vegetable drugs do not always consist of the entire plant, but frequently of only parts. In this course the general structure of the plant, from the root to reproductive organs, is taken up and considered. In the laboratory the student takes up the histology of plants, especially from the standpoint of pharmacognosy, with a brief survey of the more important plants from a systematic standpoint.

There are two recitations and one laboratory of 54 hours.

CHEMISTRY.

Professor Bennett.

Laboratory study is the basis of the work done during the first year of the Veterinary Course to become acquainted with Inorganic Chemistry and the general principles of Qualitative Analysis. Special attention is given to those compounds that are important in Veterinary Medicine. Attention is also given to
inorganic poisons and the general effects of these poisons on the animal body.

During the first term of the Sophomore year the students in Veterinary Medicine are given a course in Organic Chemistry in which they become acquainted with the various hydro-carbons, carbo-hydrates, and nitrogenous compounds, special attention being directed to those substances used in pharmaceutical preparations.

During the second term of the Sophomore year the student studies elementary Physiological Chemistry and a sufficient amount of the general principles of Quantitative Analysis to enable him to make complete analyses of urine.

The laboratory provides each student with a separate table which is furnished with water, gas, and all the needed apparatus and re-agents. The cost of this work to the student is the cost of the material and apparatus consumed or destroyed in the prosecution of the study.

**POISONOUS PLANTS.**

**PROFESSOR PAMMEL.**

**Course XVI.—** The veterinarian is frequently called upon to investigate poisoning. He should therefore be familiar with the plants responsible for poisoning live stock. In this course the subject is treated from the historical standpoint, with a brief reference to the history of toxicology; autointoxication; poisoning from ptomaines, toxines and the agents responsible for such poisoning; poisoning by fungi, like toadstools, ergot, etc. Dwelling on the life history of these fungi and the poisons they produce; the rusts and smuts, as possible causes of disease. The higher plants are then taken up in a systematic order, calling attention to the poisonous plants in the various orders and means for recognizing these plants.

One lecture and one laboratory, of forty-eight hours. Second Term, Freshman year.

**ENTOMOLOGY.**

**PROFESSOR SUMMERS.**

This course (Zoology I), given during the second term of the Freshman Year, is designed as an introduction to Zoological methods, especially to those of Systematic Zoology. The student
also gets practice in the determination of insects, which is of special use later in his study of the parasites of domestic animals. Some training is had in the use of the microscope. The lectures deal chiefly with the physiology and life history of the different orders of insects. Incidentally the general principles involved in dealing with injurious insects, including parasites, are discussed.

PATHOLOGY.

DR. GAY.

The course in Pathology extends through the Sophomore and Junior years, and must be preceded by Normal Histology. The work is divided into General Pathology, which treats of the causes of disease, its spread and generalization, the protecting and healing forces, the disturbances of circulation, retrograde disturbances of nutrition, and infiltration, hypertrophy and regeneration, inflammation and tumors; and Special Pathology, which treats of the etiology and morbid anatomy of diseases caused by streptococci, bacteria, higher fungi, protozoa, animal parasites, and those infectious diseases, the specific cause of which is not yet determined.

In the laboratory the student in General Pathology is taught the methods of preparation and preservation of gross specimens, the preparation of sections for Microscopic study, and the general technique of laboratory diagnosis. He is then given preparations for the study of the various pathological phenomena as they are considered in the class room.

COURSE XXXV._General Pathology._First Term, Sophomore year. Two recitations and one laboratory per week.

COURSE XXXVI._General Pathology._Second term, Sophomore year. Two recitations and one laboratory per week.

COURSE XXXVII._Special Pathology._First term, Junior year. Two recitations per week.

COURSE XXXVIII._Special Pathology._Second term, Junior year. Two recitations per week.

BACTERIOLOGY.

PROFESSOR PAMMEL.

History. Considering the subject from Lewenhoek's discovery in 1659, followed by the work of Plenciz who assumed a causal relation between micro-organisms and contagious diseases. The works of Pollender, Davaine, Henle and Pasteur. Theory of
fermentation, Caginard, Latour and Schmann, Bastian's theory of spontaneous generation; Pasteur's refutation; DeBary's work in higher fungi. The extravagant claims of Hallier and others. Lister's antiseptic treatment of wounds. The work of Cohn, Naegeli, Klebs, Pasteur, Buchner, Brefeld and Koch in cultivating germs. Rapid process in recent times. Anthrax, tuberculosis and germs in pus. Literature on the subject.

What are bacteria? Structure, growth, nutrition and reproduction.

Morphology and systematic position of bacteria. Their relation to other plants. Classification of Ehrenberg, of Cohn, of DeBary, of Van Tiegham, of Pasteur, of Flugge, of Zopf. Difficulties in classifying bacteria. Physiological and morphological characters. Methods of sterilization, mounting, staining and inoculation.

History of anthrax, symptomatic anthrax, malignant oedema, tetanus, glanders, tuberculosis, swine plague, hog cholera, typhoid fever, diphtheria. The germs of pus, erysipelas, yellow fever, cholera nostras, caries of teeth, etc., are discussed. The characteristic growth and the morphological characters of the germs are given. The formation of ptomaines and enzymes and their relation to disease.

Muir and Ritchie's "Manual of Bacteriology" is used as a text book.

Recitations once per week. One laboratory forty-eight hours. First Term, Sophomore Year.

PHYSICAL DIAGNOSIS.

COURSE LIV.—This course is designed to be introductory to the study of Veterinary medicine. Since a correct diagnosis is the basis of all medicine, it is essential that the student be taught to recognize the various disturbances of function and the pathological conditions they indicate.

The arts and methods of diagnosis are first considered, then general examination, special examination of the different apparatuses of the animal body and finally specific examinations, including experimental inoculations as a means of diagnosis, are studied.

One lecture per week. First term, Sophomore year.
VERTEBRATE ZOOLOGY.

PROFESSOR SUMMERS.

This course (Zoology II), given during the first term of the Sophomore year, consists mainly of a laboratory study of the anatomy, including histology, of a typical vertebrate. This serves as an introduction to the methods of gross dissection, and gives practice in the use of the microscope. The study of a series of other forms of vertebrates follows, leading to a knowledge of general vertebrate structure. The laboratory work is supplemented by lectures on the general morphology and classification of vertebrates.

ANIMAL PARASITES.

PROFESSOR SUMMERS.

In the second term of the Sophomore year is given a course (Zoology VIII), of lectures upon the Zoo-parasites of domestic animals. Detailed descriptions are given of the life histories of the most important species attacking animals in the United States, special emphasis being laid upon such portions of their economy as may render them open to treatment by preventive or remedial measures.

ANIMAL HUSBANDRY.

The following courses are given in Animal Husbandry:

Course I.—Market Types—Cattle and Sheep.—First Term, Sophomore Year. This course covers the judging of the different market classes of cattle (beef and dairy) and sheep (mutton and wool). Judging, two 2-hour periods per week. Professor Rutherford and Mr. Dinsmore.

Course II.—Market Types—Horses and Swine.—Second Term, Sophomore Year. This course covers the judging of the different market classes of horses (light and heavy) and swine (bacon and fat). Judging, two 2-hour periods per week. Professor Rutherford and Mr. Dinsmore.

Course III.—Breed Types—Cattle and Sheep.—First Term, Junior year. This course covers the judging of representatives of the different breeds according to their official standards; also a study of their origin, history, characteristics, and adaptability to different conditions of climate and soil. Lectures two hour
periods per week. Judging two 2-hour periods per week. Professor Rutherford and Mr. Dinsmore.

COURSE IV.—Breed Types—Horses and Swine.—Second Term, Junior Year. This course covers the judging of representatives of the different breeds according to their official standards; also a study of their origin, history and characteristics, and adaptability to different conditions of climate and soil. Lectures two 1-hour periods per week. Judging two 2-hour periods per week. Professor Rutherford and Mr. Dinsmore.

COURSE V.—Live Stock Management.—The housing, feeding, care and management of the various classes of live stock. Lectures two 1-hour periods per week. Second Term, Junior Year. Professor Rutherford.

COURSE VIII.—Principles of Breeding.—First Term, Junior Year. This course embraces a study of the principles of breeding, including selection, heredity, atavism, variation, fecundity; with the presentation of the methods of breeding, in-and-in breeding, cross breeding, etc., and a historical study of their results. In addition, the several features relating to the higher breeding of pure bred stock are made the subject of study and investigation. Two 1-hour periods per week. Professor Curtiss.

COURSE IX.—Animal Nutrition.—Second Term, Senior Year. This course includes anatomy and physiology of the digestive system, the purpose of nutrition, theory and practical economy of rations for growth, fattening, milk or maintenance; sanitation of feeds, and hygiene of the farm. Five 1-hour periods per week. Professor Kennedy.

THEORY AND PRACTICE OF VETERINARY MEDICINE.

DR. JACOB.

The study of medicine is begun the first term of the Junior Year and is continued throughout the course.

COURSE XL.—First Term, Junior Year, three lectures per week.

COURSE XLI.—Second Term, Junior Year, three lectures per week.

COURSE XLII.—First Term, Senior Year, three lectures per week.

COURSE XLIII.—Second Term, Senior Year, three lectures per week.

Instruction consists chiefly of lectures supplemented by
practice in the daily clinics. Courses XL, XLI, XLII cover the work on congestion, inflammation and fever, diseases of the respiratory system, circulatory system, blood and lymph; digestive apparatus, nervous system, genito-urinary system, diseases of the eye, skin, and the non-infectious constitutional diseases.

Course XLIII is devoted to the study of the history, etiology, symptoms, lesions, differential diagnosis and treatment of the infectious animal diseases and diseases caused by animal parasites. Assuming the student to have had the prescribed work in bacteriology it is deemed advisable to review the morphology and the cultural characteristics of the specific organisms in connection with the symptoms and lesions which they produce.

Thus the importance of a bacteriological examination as a means of positive diagnosis is emphasized.

**OPHTHALMOLOGY.**

**DR. HARRIMAN.**

Course XLIX.—The Course in Ophthalmology is given in the second term of the Senior Year. It consists of one lecture per week supplemented by demonstrations upon models and cases.

It is the aim of this course to familiarize the student with methods of examination and diagnosis in particular, as well as general principles and special forms of treatment.

**PRINCIPLES AND PRACTICE OF SURGERY.**

**DR. MCNEIL.**

This subject is taught to Junior and Senior students in four courses, as follows:

Course X.—First Term Junior Year, three lectures each week.

Course XI.—Second Term, Junior Year, three hours each week.

Course XII.—First Term, Senior Year, three hours each week.

Course XIII.—Second Term, Senior Year, three hours each week.

General Surgery embraces the following subjects: Surgical bacteriology, the pathology and treatment of inflammation, diseases of the bones, nerves, articulations, muscles, tendons, tendon sheaths and bursae; methods of amputation and exarticulation;
suturing and the general treatment of wounds; methods of anaesthesia; intra-venous and sub-cutaneous injections; castration; methods of restraint in securing animals, and the methods of actual cautery.

Special Surgery includes the surgical diseases of the head, neck, thorax, abdomen, urino-genital organs, fore-limb, hind-limb, vertebrae, pelvis, and the surgical diseases of the stomach and bowels.

EMBRYOLOGY.

PROFESSOR SUMMERS.

The foundation of this course (Zoology V), consists of laboratory work on the chick and to a small extent on the frog. The lectures deal with the general principles of development, including the structure of the germ cells, maturation and fertilization, and the modifications of cleavage and gastrulation found in the different classes of vertebrates. The peculiarities of the development of mammals are also discussed.

HORSE-SHOEING.

Course XVI.—This course is devoted to the study of the anatomy and physiology of the foot; the relation between the form of the foot and direction of the limb; variation in the flight of the foot; style of going; the shoeing of normal and irregular feet; winter shoeing; hoof nurture; correction of defects in gait and the methods of shoeing hoofs defective in form or diseased. Instruction is by two lectures per week the second term, Junior year.

MILK INSPECTION.

Dairying XVIII.—This course embraces a thorough study of the composition of milk and its products and their variations. The Babcock test for finding the amount of butter-fat; the use of the lactometer for finding the specific gravity and calculating the milk solids are made leading features of the course. The detection of the most common adulterations and preservatives in milk is also taken up.

The course consists of one laboratory period and one recitation per week. It is given in the second term of the Junior year. Mr. Bouska.
SURGICAL ANATOMY.

Course V.—This work is discussed during the first term of the Senior year, being a continuation of the course in anatomy, but studied with special reference to its relation to surgery and not as an abstract science.

The student is taught to apply the systematic anatomy studied during the first two years.

The course embraces surface anatomy, the outline of organs, location of joints, significance of bony projections and muscular swells, position, relations and means of recognizing various arteries and nerves, relation of tissues in organs to each other including a general review of all practical anatomy.

PRACTICAL OPERATIVE SURGERY.

In the course in Operative Surgery the student is required to perform all the operations that are found necessary in veterinary practice. Five hours each week are devoted to this work. The subject is covered in two courses, as follows:

Course XIV.—First Term, Senior Year.
Course XV.—Second Term, Senior Year.

SANITARY SCIENCE.

Dr. Jacob.

These courses are designed to train the student in all that pertains to preventive medicine.

Course XLIV.—Consists of the consideration of health and disease; the etiology of disease, predisposing and exciting; means and manner of propagation and transmission of infectious diseases; general hygiene and stable sanitation, including ventilation, drainage, selection of site and materials for construction. Two lectures per week, First Term, Senior Year.

Course XLV.—A consideration of practical methods of disinfection with a discussion of disinfecting agents, physical and chemical; methods of dipping and dips; principles of serum therapy, vaccination and quarantine. During the latter part of this course the sanitary police of the individual infectious and parasitic animal diseases are discussed. Two lectures per week, Second Term, Senior Year.
MEAT INSPECTION.

This comparatively new branch of veterinary work is given the attention which its present importance deserves. The subject is approached from the American point of view, and the students are taught how to perform the work with that rapidity and thoroughness required by the U. S. Bureau of Animal Industry. The instruction which the student receives in the courses in anatomy, physiology, pathology, bacteriology, animal parasites and veterinary medicine makes it possible to cover this subject in the one course described below:

**Course XXXIX.**—Two lectures are given each week in the first term of the Senior Year, embracing the following topics: The physical characters of normal flesh and organs; the methods of slaughter; the principles of refrigeration and preservation; the effect of accidental and pathological conditions on the preservation and edibility of meats.

The putrefaction of meats and the consequences of the ingestion of such meats by man; the effects upon the meat of various constitutional and infectious diseases; the transmissibility of the disease to man; the effects of cooking on transmissibility; the meat inspection laws of the United States.

**CONFORMATION AND SOUNDNESS.**

**Course XVIII.**—This course is taught by lectures and practical demonstrations upon the living animal. The student studies the conformation of the horse with special reference to the defects which exist and predispose to pathological changes causing unsoundness.

Comparisons are made between normal and diseased parts and a systematic classification arranged to conform to the regions and parts involved.

**OBSTETRICS.**

**Course XIX.**—This course is devoted to physiological obstetrics; Ovulation, oestrum, fecundation, sterility, gestation, the hygiene of pregnant animals; and parturition. One hour per week, First Term, Senior Year.

This work is preceded by Zoology V.

**Course XX.**—This course is devoted to pathological obstetrics; the diseases and accidents of pregnancy; dystokia; obstetrical operations; the sequelae of parturition; and diseases of
the young animal. One lecture per week, Second Term, Senior Year.

**HIPPOLOGY.**

**GENERAL LINCOLN.**

**Course XLVII.**—It is as essential for the veterinarian to maintain the health and strength of the horse as to care for and treat the sick and disabled animal.

This course studies the horse as a machine and the bridle, saddle and harness as aids in the use of his powers, as well as the management of the horse in the stable and in the field so as to best maintain his usefulness.

The following topics are studied: The framework of the horse from a mechanical standpoint; bits and bitting; saddling; draft and harness. The care of animals in garrison and in the field, including watering, feeding and grooming.

This subject is taught by one lecture per week the second term of the Senior Year.

**JURISPRUDENCE.**

**Mr. Lee.**

**Course XLVIII.**—The work in this course consists of a study of the rights and duties of the veterinary practitioner; the rights and duties of the owner or value of domestic animals; contracts and sales as applied to dealings in live stock; the subject of expert testimony. One lecture is given each week in the second term of the Senior Year.

**CLINICS.**

**Drs. M'Neil, Jacob and Stuhr.**

The practical work afforded by the clinics is considered a highly essential part of the instruction given to the student. A student's didactic instruction will do him but little good if at the same time he is not required to put his knowledge into practice. Also, a student shows his fitness for membership in the profession chiefly by the degree of aptness which he exhibits in his practical work. The clinical training which he gets here gives him an opportunity to acquire the aptitude which is requisite for his professional work. Free clinics are held at the hospital every day from 1 to 3 o'clock P. M. The cases brought to the hospital for treatment are assigned to the senior students in alphabetical
order and the students are required to prepare a full report of their examination, diagnosis, and proposed treatment and hand it to the clinician when he comes to examine the case. These reports are then graded by the clinician according to their merits. The hospital cases are assigned to the senior students who are required to treat them and keep a careful report of the case under the direction and supervision of the clinical instructors. The junior students are required to assist the seniors in their clinical and hospital work. The term grades of the students are made up from their attendance, and character of their clinical and hospital work. The clinical professor upon examination of a case or performance of an operation or administration of internal treatment gives to the students a clinical lecture upon the various aspects of the case before them. In this exhaustive way each case is made to yield the utmost good to the student. Animals of all species are brought in considerable numbers to the hospital from the surrounding excellent stock-growing territory and in this way the students come into intimate contact with a great variety of diseases, and acquire a familiarity with their treatment such as will enable them to give good service to their clients immediately upon their entrance into practice.

FRESHMAN YEAR.

FIRST TERM.

Comparative Anatomy, 3
Dissection, 6
Comparative Physiology, 1
Histology, 2
(One laboratory period.)
Materia Medica, 1
Pharmacy, 2
(One laboratory period.)
Structural Botany, 3
(One laboratory period.)
Inorganic Chemistry, 3
(One laboratory period.)
Military Drill, 2

SECOND TERM.

Comparative Anatomy, 3
(Veterinary, II.)
Dissection, 6
Comparative Physiology, 1
Histology, 2
   (One laboratory period.)
Materia Medicà, 1
Pharmacy, 2
   (One laboratory period.)
Poisonous Plants and Fungi, 2
   (One laboratory period.)
Entomology, 2
   (One laboratory period.)
Inorganic Chemistry, 3
   (One laboratory period.)
Military Drill, 2

SOPHOMORE YEAR.

FIRST TERM.

Comparative Anatomy, 3
Dissection, 6
Comparative Physiology, 2
Live Stock and Score Card Practice, 2
   (Two 2-hour periods.)
Therapeutics, 1
General Pathology, 3
   (One laboratory period.)
Bacteriology, 2
   (One laboratory period.)
Zoology, 4
   (One laboratory period.)
Physical Diagnosis, 1
Organic Chemistry, 2
Military Drill, 2

SECOND TERM.

Comparative Anatomy, 3
Dissection, 6
Comparative Physiology, 2
Live Stock and Score Card Practice, 2
   (Two 2-hour periods.)
Therapeutics, 1
General Pathology, 3

(Veterinary, VII.)
(Veterinary, XXII.)
(Veterinary, XXXIV.)
(Veterinary, XXVIII.)
(Veterinary, XXVI.)
(Botany, XVI.)
(Zoology, I.)
(Chemistry, IV.)
(Military, II.)

(Veterinary, III.)
(Veterinary, VIII.)
(Veterinary, XXIII.)
(Veterinary, XXIX.)
(Veterinary, XXXV.)
(Botany, VII.)
(Zoology, II.)
(Veterinary, LIV.)
(Chemistry, X.)
(Military, III.)

(Veterinary, IV.)
(Veterinary, IX.)
(Veterinary, XXIV.)
(Animal Husbandry, II.)
(Veterinary, XXX.)
(Veterinary, XXXVI.)
(One laboratory period.)
Animal Parasites, 2
Physiological Chemistry, 3
(One laboratory period.)
Military Drill, 2

JUNIOR YEAR.

FIRST TERM.

Theory and Practice of Medicine, 3 (Veterinary, XL.)
Principles and Practice of Surgery, 3 (Veterinary, X.)
Live Stock and Score Card Practice, 4 (Animal Husbandry, III.)
(Two lectures and two judging periods.)
Principles of Breeding, 2 (Animal Husbandry, VIII.)
Therapeutics, 1 (Veterinary, XXXI.)
Special Pathology, 2 (Veterinary, XXXVII.)
Embryology, 3 (Zoology, V.)
Clinics, 6 (Veterinary L.)

SECOND TERM.

Theory and Practice of Medicine, 3 (Veterinary, XLI.)
Principles and Practice of Surgery, 3 (Veterinary, XI.)
Live Stock and Score Card Practice, 4 (Animal Husbandry, IV.)
(Two lectures and two judging periods.)
Live Stock Management, 2 (Animal Husbandry, V.)
Therapeutics, 1 (Veterinary, XXXII.)
Special Pathology, 2 (Veterinary, XXXVIII.)
Milk Inspection, 2 (Dairying, XVIII.)
(One laboratory period.)
Horse Shoeing, 2 (Veterinary, XVI.)
Clinics, 6 (Veterinary, LI.)

SENIOR YEAR.

FIRST TERM.

Theory and Practice of Medicine, 3 (Veterinary, XLII.)
Principles and Practice of Surgery, 3 (Veterinary, XII.)
Operative Surgery, 5 (Veterinary, XIV.)
Surgical Anatomy, 1 (Veterinary, V.)
Ophthalmology, 1 (Veterinary, XLIX.)
Sanitary Science, 2 (Veterinary, XLIV.)
Obstetrics, 1
Hippology, 1
Meat Inspection, 2
Jurisprudence, 1
Clinics, 6

SECOND TERM.

Theory and Practice of Medicine, 3
Principles and Practice of Surgery, 3
Operative Surgery, 5
Sanitary Science, 2
Animal Nutrition, 5
Obstetrics, 1
Hippology, 1
Conformation and Soundness, 2
Clinics, 6

TEXT AND REFERENCE BOOKS.

Anatomy.—Chauveau’s “Anatomy of the Domesticated Animals.”
McFadyean’s “Comparative Anatomy,” McFadyean’s “Dissection Guide.”
Schmaltz’s “Atlas der Anatomie des Pferdes.”

Physiology.—F. Smith’s “A Manual of Veterinary Physiology.”
“American Text Book of Physiology.”

Histology.—Szymonowicz-MacCallum.

Materia Medica.—“United States Dispensatory.”

Pharmacy.—“Remington’s Practice of Pharmacy.”

Chemistry.—Bennett’s “General Chemistry and Qualitative Analysis.” Remsen’s “Organic Chemistry.” Bunge’s “Physiological Chemistry.”

Botany.—Atkinson’s “Elementary Botany.”

Therapeutics.—Winslow’s “Veterinary Materia Medica and Therapeutics.”

General Pathology.—Zeigler, Stengel.

Special Pathology.—Moore.

Zoology.—Comstock and Kellogg’s “Elements of Insect Anatomy,” for beginners; none for advanced work.

Bacteriology.—Muir and Ritchie’s “Manual of Bacteriology.”

Animal Husbandry.—Craig’s “Judging Live Stock.”

Volume III Regional Surgery.
Williams Surgical Operations.

Medicine.—Law's "Veterinary Medicine." Hayes' Translation of "Infective Diseases of Animals" by Friedberger and Frohner.

Animal Husbandry.—Shaw's "Animal Breeding."

Embryology.—Foster and Balfour's "The Elements of Embryology."


Animal Husbandry.—Jordan's "The Feeding of Animals."

Henry's "Feeds and Feeding."

Conformation and Soundness.—Goubaux and Barrier's "Exterior of the Horse," translated by Harger. Hayes, "Points of the Horse."

Dictionary.—Dorland, Gould.
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**Absent on leave.
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Instructor in French.

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PROF. ELWOOD MEAD,

C. J. ELLIOTT,

ROBT. M. DYER, '91,
Steel-Pole Electric Transmission Line Construction.

J. C. HORNING, '99,
Central Station Heating

DIVISION OF ENGINEERING

The work of the Division of Engineering of the College is
apportioned among four departments, viz.:
The Department of Mechanical Engineering.
The Department of Civil Engineering.
The Department of Electrical Engineering.
The Department of Mining Engineering.

Through these departments the College offers systematic
courses in Mechanical Engineering, Civil Engineering, Electrical
Engineering and Mining Engineering, each leading to its appro-
priate degree.

These several courses are planned with a view to fitting those
pursuing them to enter professional engineering work and to
advance therein more rapidly than would be possible without the
preparation furnished by a College course. Experience shows
that the graduates from technical schools generally excel in their
chosen lines and it is worthy of note in this connection that rail-
roads, manufacturers and other corporations, as well as munici-
palities and government departments, are demanding that
those who seek promotion in their technical departments shall have secured a technical training such as can now be obtained in the engineering schools of the country.

It is very manifest, because of the lack of time in the course, the multiplicity of general subjects which must be emphasized and the lack of uniformity of details in the profession due to the local and personal differences which exist in the conduct of engineering work of all kinds, that no college course in engineering can give to a student the training and experience in all the details of his profession. Moreover it seldom happens that a student in college knows definitely what specific branch of his chosen profession he will follow, and it would be folly for him to spend his time on details which he may never use. A thorough education in the branches of pure and applied science which are related to professional work is essential. Having this the engineer readily acquires familiarity with the details of his work. Without it no amount of experience with details alone can give an engineer high rank in his profession.

Therefore it is believed that a college course in engineering should be in the first place a training of the mind of the student toward ability to think logically, to observe accurately and by the application of the former acquirement to the latter to reach correct inferences; in the second place such a course should acquaint the student with approved methods of draughting and computing, with the use and limits of the instruments employed in the every day work of his profession and should give him an opportunity for experimental work bearing upon engineering problems; in the third place such a course should provide that the student acquire the art of expressing himself, publicly and privately, in good English and should furnish him with some knowledge of the history of his own and preceding times, thus equipping him to be an ornament to his profession, and an enlightened member of society.

In accordance with the views above expressed the engineering courses of this college include a variety of studies. These may be conveniently grouped as culture studies, training or disciplinary studies, professional studies, and practical work.

**CULTURE STUDIES.**

Two years' work in modern languages, (French or German) three years' work in English, culminating in seminar work, two
years' work in history required and one year elective, economic and civics are found in all courses.

The French or German serves the double purpose of giving access to foreign technical literature and of aiding the work in English. History, economic science and civics cultivate interest in mankind at large and are thus broadening to the student.

If possible the amount of time devoted to culture studies would be increased, because it is believed that the engineering graduate profits by the time spent in general study almost as much as by that devoted to the professional studies.

TRAINING STUDIES.

Mathematics and physics constitute the backbone of engineering and of the engineer because by their study are secured habits of logical thinking and a knowledge of the fundamental principles of matter—the laws of nature.

MATHEMATICS.—The study of Mathematics begins in the Academic Year and extends through the Sophomore Year.

Advanced Algebra, Plane and Solid Geometry, Plane Trigonometry, Analytical Geometry and Calculus are included in this course.

APPLIED MATHEMATICS, e. g., analytical mechanics, and hydraulics are studied in the Junior and Senior Years.

PHYSICS.—The course in Physics is begun in the Sophomore Year. The ground of mechanics, heat, light, and sound is very thoroughly covered. In the Junior Year the subject of electricity and magnetism is introduced and the engineering student begins elementary laboratory work in physical measurements.

Students in mechanical engineering and electrical engineering continue work in physics in the Senior Year.

CHEMISTRY.—Chemistry is also a training study, especially in laboratory work, where habits of observing and recording facts are thoroughly instilled. The study also serves as a preparation for the study of the materials of engineering and other professional studies. With the increase in the application of both chemistry and engineering to the arts, as in electrolytic treatment of ores, the refining of metals, the manufacture of cement and in many other industrial operations, the subject of chemistry has an important place in the training of engineers.

The study of chemistry is pursued in the first and second terms of the Sophomore Year of this course.
those who seek promotion in their technical departments shall have secured a technical training such as can now be obtained in the engineering schools of the country.

It is very manifest, because of the lack of time in the course, the multiplicity of general subjects which must be emphasized and the lack of uniformity of details in the profession due to the local and personal differences which exist in the conduct of engineering work of all kinds, that no college course in engineering can give to a student the training and experience in all the details of his profession. Moreover it seldom happens that a student in college knows definitely what specific branch of his chosen profession he will follow, and it would be folly for him to spend his time on details which he may never use. A thorough education in the branches of pure and applied science which are related to professional work is essential. Having this the engineer readily acquires familiarity with the details of his work. Without it no amount of experience with details alone can give an engineer high rank in his profession.

Therefore it is believed that a college course in engineering should be in the first place a training of the mind of the student toward ability to think logically, to observe accurately and by the application of the former acquirement to the latter to reach correct inferences; in the second place such a course should acquaint the student with approved methods of draughting and computing, with the use and limits of the instruments employed in the everyday work of his profession and should give him an opportunity for experimental work bearing upon engineering problems; in the third place such a course should provide that the student acquire the art of expressing himself, publicly and privately, in good English and should furnish him with some knowledge of the history of his own and preceding times, thus equipping him to be an ornament to his profession, and an enlightened member of society.

In accordance with the views above expressed the engineering courses of this college include a variety of studies. These may be conveniently grouped as culture studies, training or disciplinary studies, professional studies, and practical work.

CULTURE STUDIES.

Two years' work in modern languages, (French or German) three years' work in English, culminating in seminar work, two
years' work in history required and one year elective, economic and civics are found in all courses.

The French or German serves the double purpose of giving access to foreign technical literature and of aiding the work in English. History, economic science and civics cultivate interest in man kind at large and are thus broadening to the student.

If possible the amount of time devoted to culture studies would be increased, because it is believed that the engineering graduate profits by the time spent in general study almost as much as by that devoted to the professional studies.

TRAINING STUDIES.

Mathematics and physics constitute the backbone of engineering and of the engineer because by their study are secured habits of logical thinking and a knowledge of the fundamental principles of matter—the laws of nature.

MATHEMATICS.—The study of Mathematics begins in the Academic Year and extends through the Sophomore Year.

Advanced Algebra, Plane and Solid Geometry, Plane Trigonometry, Analytical Geometry and Calculus are included in this course.

APPLIED MATHEMATICS, e. g., analytical mechanics and hydraulics are studied in the Junior and Senior Years.

PHYSICS.—The course in Physics is begun in the Sophomore Year. The ground of mechanics, heat, light, and sound is very thoroughly covered. In the Junior Year the subject of electricity and magnetism is introduced and the engineering student begins elementary laboratory work in physical measurements.

Students in mechanical engineering and electrical engineering continue work in physics in the Senior Year.

CHEMISTRY.—Chemistry is also a training study, especially in laboratory work, where habits of observing and recording facts are thoroughly instilled. The study also serves as a preparation for the study of the materials of engineering and other professional studies. With the increase in the application of both chemistry and engineering to the arts, as in electrolytic treatment of ores, the refining of metals, the manufacture of cement and in many other industrial operations, the subject of chemistry has an important place in the training of engineers.

The study of chemistry is pursued in the first and second terms of the Sophomore Year of this course.
The text book work extends through the year and parallel thereto is a course in laboratory work, wherein the student becomes familiar with the general laboratory methods for a qualitative analysis.

PROFESSIONAL STUDIES AND PRACTICAL WORK.

Considerable time in the Junior and Senior Years is given by all engineering students to work having practical bearing on their profession; the object being to correlate, in some measure, theory and practice.

Draughting, shop work and field work are begun upon entrance and continued in proper proportions throughout the several courses. By their means students are frequently able to obtain valuable practical experience during their vacations and are thereby, in turn, benefited by being able to see the usefulness of their college work more clearly than before.

By such vacation work the student is placed in a measure, in the position of the so called practical engineer, who, if he be honest with himself, wishes for the advantages of a technical education.

In the professional studies the student, through his teachers, text books, and actual practice gets into touch with the problems which the engineers of the day are trying to solve, and thus learns to appreciate the difficulties which confront them.

The professional and practical studies culminate in the graduation thesis in which the student is expected to show energy, determination, resourcefulness and discrimination in the solving of a problem whose solution will add something to the store of engineering knowledge.

A certain amount of undergraduate work and a large amount of graduate work as well as the research work carried on by the individual members of the engineering faculty is devoted to the various industrial interests of the state.

Advanced students are given an opportunity to assist in all research or commercial work which is being conducted by the engineering departments.

RELATION OF THE IOWA STATE COLLEGE TO THE INDUSTRIAL INTERESTS OF THE STATE.

While the principal business of the several engineering departments of the college is undoubtedly to give instruction to
their students, the fact is recognized that the state contributes largely to the financial support of the College and that in return, not only should the College give tuition to the children of Iowa, but it should contribute as much as possible to the successful carrying on of the industrial interests of the state. By the establishment of experiment stations the national government has recognized the duty of the land grant colleges to the agricultural interests. The engineering departments of this College believe that it is their proper business to aid the other industrial enterprises of the state.

With this thought as the motive, the several engineering departments have undertaken during the past ten years and will continue in the future to undertake to carry on investigations of interest and value to the industries of Iowa, as need therefor may arise, in so far as the funds available will permit.

Up to the present time much has been done along the lines of sewage disposal and other phases of sanitary engineering, of clay working and coal mining, of electric lighting and telephone work, of gypsum and other mineral deposits and of power generation and transmission.

The results of these investigations are published in special bulletins, in the technical press, and in The Iowa Engineer, a quarterly magazine published by the College.

While Iowa is primarily an agricultural state, the needs of modern life prompt to the development to the full of all natural resources and the Division of Engineering wishes to aid in every way in this development.

Owing to the lack of funds, the aid thus freely offered is limited somewhat. The Legislature at its last session appropriated the sum of six thousand dollars for the biennial period for the establishment of an engineering experiment station to enlarge the scope and usefulness of the above mentioned feature of the engineering work at this College. It is expected that the results obtained with this small appropriation will justify its increase at the next session of the Legislature.

BUILDINGS AND EQUIPMENT.

The buildings occupied exclusively by the Division of Engineering are the Engineering Hall, the Engineering Laboratory, the Power Station, the Forge Shop and Foundry, the Pattern Shop and Locomotive Laboratory.
Engineering Hall. This building, completed for occupancy at the opening of the spring term, 1903, is a fire proof building, four stories in height, having a frontage of 208 feet, a depth of 70 feet, with a semicircular wing at back, three stories in height.

The architecture is classic in treatment. The exterior is Bedford stone with plate glass windows. The interior is finished in pressed brick and enameled brick in corridors and lavatories.

The building is heated and ventilated by the hot blast system with automatic regulation, is electric lighted and equipped with modern plumbing.

On the first floor are located the dynamo laboratory, workshop and special laboratories of the department of electrical engineering, the cement laboratories of the department of civil engineering, the metallurgical laboratory of the department of mining engineering, and research rooms of the department of mechanical engineering. Also public lavatories for men and women. The corridor of this floor is furnished with 400 lockers for students.

On the second and third floors are respectively the offices of the departments of Mechanical Engineering and Electrical Engineering, and of the departments of Civil Engineering and Mining Engineering. On the second floor is the general assembly room, seating 300, two lecture rooms of the department of Mechanical Engineering, two laboratories for electrical engineering and instrument and cabinet rooms of the department of electrical engineering.

On the third floor are class, draughting and seminar rooms of the department of Civil Engineering, class and seminar rooms and museum of the department of Mining Engineering, a general engineering museum and a faculty room.

On the fourth floor are two draughting rooms and office of the department of Mechanical Engineering, draughting and instrument rooms of the department of Civil Engineering and photographic and blue-print rooms for the joint use of all departments.

The heating and ventilating apparatus is located in the basement, steam therefore being supplied through a tunnel communicating with the Power House.

The interior finish is light antique oak and the furniture is golden oak. Ample blackboards, convenient and comfortable furniture and furnishings are provided for the needs of the several departments.

Engineering Laboratory. This building, formerly the prin-
principal engineering building and headquarters of the several departments, is now used for machine shop and engineering laboratory purposes. The arrangement and equipment of this building are described at length in connection with the mechanical and civil engineering departments.

Power Station. This is a one story brick building, 36x120, devoted to the lighting and pumping plants of the College, and to the heating plant for the engineering buildings. All of the equipment is used for purposes of instruction, as far as this does not interfere with its other uses. The building contains an engine and dynamo room, a boiler room and a pump room.

Forge Shop and Foundry. This is a one story brick building 38x78 feet, containing the equipment for instruction in forge shop and foundry practice. The roof trusses are of steel and calculated to carry traveling cranes for transferring heavy castings and forgings.

Pattern Shop. This is a one story brick building, 38x120 feet, devoted to the work of instruction in bench work, wood turning and pattern work. A fire proof room is provided for the storage of patterns.

Locomotive Laboratory. For the temporary protection of the locomotive donated to the Department of Mechanical Engineering by the Chicago & Northwestern railway, a corrugated iron structure has been provided.

DEPARTMENT OF MECHANICAL ENGINEERING.

GEORGE WELTON BISSELL, PROFESSOR.
W. H. MEEKER, ASSOCIATE PROFESSOR.
HERBERT W. DOW, ASSISTANT PROFESSOR.
J. A. KNESCHE, H. OTIS, M. L. KING, JOHN LAWTON, AND D. M. CURL, ASSISTANTS.

The headquarters of this department are in Engineering Hall. The principal offices are on the second floor. On the same floor are a lecture room and a combination class and drawing room. On the first floor are two rooms devoted to research work in mechanical engineering. On the fourth floor are two draughting rooms accommodating 200 students at one time, fitted with combination drawing tables, instrument cabinets and boards, whereby
600 students can be assigned to mechanical drawing and designing in the department. In conjunction with these rooms is a commodious office for the instructing staff in drawing. In addition the department has a common interest in and use of a photographic room, a blue print room on the fourth floor, the engineering museum, and faculty room on the third floor and the assembly room on the second floor.

The draughting and class and lecture rooms are equipped with ample blackboard space and the offices are fitted with the most convenient furniture for efficient and comfortable administration of the interests of the department.

In addition to the above space in the new Engineering Hall, the department occupies the Engineering Laboratory, the Power House, the Forge and Foundry, the Pattern Shop and the Locomotive Laboratory.

In the Engineering Laboratory the basement is used as a hydraulic laboratory conjointly with the Department of Civil Engineering, the first floor is used as a machine shop, the second floor as an engineering laboratory and the third floor as free hand drawing rooms.

SHOP WORK.

Students in mechanical engineering pursue the full course in shop work, which consists of eight hours per week for three and one-half years. Partial courses are given to the students in the mining and electrical engineering courses.

The system of instruction in the several shops begins with graded exercises calculated to familiarize the student with tools and with the materials used. The exercises are supplanted as soon as possible by work on machines or parts thereof which are to be put into actual use. By this arrangement greater interest is maintained in the work than would be possible with a strict adherence to the exercise system. The object of the shop work is not to teach trades, but to acquaint the student with the tools, materials and difficulties of shop practice and to establish in the mind principles which will aid him in designing and construction work in the other studies of his course and in his professional career.

The machine shops are equipped with a twenty-four by twenty-four inch planer, a milling machine, a universal grinding machine, a shaper, a drill press, two emery grinders, a polishing
wheel, a power hack saw, a cutting off machine, eight engine lathes of capacities from ten to twenty inch swing and three to ten feet between centers, and three speed and drilling lathes together with the usual assortment of small tools in the tool room. Power is furnished to this shop by an electric motor.

The pattern shop is a brick building, one story high with spacious attic for storage of lumber. The building is one hundred and twenty-eight feet long by thirty feet wide. A tool room twelve by twenty feet is screened off in the center. A fire proof room is provided for patterns. The equipment of the pattern shop consists of a universal buzz saw, a mortising machine, planer, buzz planer, band saw, jig saw, grindstone, fifteen turning lathes, benches for twenty students, twenty-four complete sets of small tools and a number of special tools. Power for this building is furnished by a twenty horse power electric motor.

The forge and foundry equipment are housed under one roof in a brick building seventy-eight by thirty-eight feet. A steel truss roof structure of substantial construction provides support for an overhead traveling crane, which serves the whole floor for handling heavy ladles, castings and forgings. Twelve forges, an oil burning annealing and tempering furnace, donated by the Rockwell Engineering Co., with blower and exhaust fan, drill press, vises, anvils, grindstone and small tools, such as sledges, fullers and swages, constitute the equipment for forge work.

A cupola and blower for melting cast iron, a brass furnace, a core oven, core benches, twelve sets of moulder's tools, crucibles and a large assortment of flasks are used for foundry work. An electric motor supplies power for the forge and foundry.

Students are advised to work in outside shops during their vacations. Experience obtained in this way may be credited in the shop work required in the regular course.

DRAWING.

The drawing room work begins with free hand drawing and object drawing, and is followed successively by machine sketching, mechanical, kinematic drawing and designing. The latter division occupies the last two years of the course.

The object sought by the drawing room course is to enable the student to make, as quickly as possible, neat and accurate working drawings, to design, in general and in detail, machines or parts thereof, and to apply throughout his knowledge of shop
methods and his theoretical information acquired in the laboratory and classroom.

The free hand drawing room is equipped with tables, models and machine parts for giving instruction to students in sections of fifty.

The two large drawing rooms on the fourth floor of Engineering Hall and a part of the combination drawing and class room on the second floor of the same building are equipped with fifty combination drawing tables, each accommodating four students at once. The drawing boards are placed in frames adjustable as to height and angle and equipped with parallel rulers. Each unit has twelve drawers which are assigned to students for their drawing instruments and supplies.

Extra drawing boards are supplied so that each place can be used by more than one student at different periods.

An extensive collection of blue-prints, photographs, drawings and trade catalogues, as well as machines and parts thereof, constitute an important part of the working equipment in this branch of the work.

**EXPERIMENTAL ENGINEERING.**

Experimental work begins with the Junior Year and extends to the end of the course. The instruction in this work is thorough; its scope being indicated by the following list of experiments:

Tensile, transverse and compression tests of materials, properties and lubricants, measurements of power by absorption and transmission dynamotors, steam gauge and indicator spring calibration, flue gas analysis, indicator practice, variation of engine speed, fan-blower tests, calorimetry, including throttling and separating calorimeters, weir and water meter calibration, efficiency tests of steam engines, boilers, injectors, and steam heating, electric lighting, refrigerating, power and pumping plants, and thermal analysis of the steam engine, coal calorimetry, besides a number of special experiments in the line of investigation. Tests on power plants outside of the College are made as frequently as possible. The engineering laboratory work usually culminates in the thesis, which is an exhaustive investigation of a limited subject. From four to five hundred hours of actual time are spent on thesis by students in the engineering courses.

The power house contains the complete electric light and
power and pumping plants of the College, all of which is available for experimental work, and constitutes a part of the engineering laboratory equipment of the engineering departments of the College. In the power house are a 100-H. P. Scotch boiler, a 51-H. P. Babcock & Wilcox boiler, and a 264-H. P. Cahall horizontal water tube boiler, a 75-H. P. Straight Line engine, a 50-H. P. Ball engine, a 40-H. P. Buckeye engine, and a 35-H. P. Ideal engine, with five dynamos alternating and direct current from 15 to 60 kilowatt capacity. In addition to the above the engineering laboratory equipment of the department consists of a twelve horse power Otto gasoline engine, a five horse power Lennox gasoline engine, a Wheeler condenser, three Worthington and three other water meters, a Pelton water motor, a Holly duplex pump, a Morris Machine Works centrifugal pump, injectors, weir and weighing tanks, gas meters, a Crosby steam gage tester, fan blowers for experimental work, Westinghouse and New York air pumps, a 100,000 pound Riehle testing machine with Gray autographic device, a 50,000 pound Olsen testing machine, an Olsen torsion testing machine, a Thurston oil tester, a complete De La Vergne refrigerating machine, gas and air analysis apparatus, anemometer, two Thompson, two Crosby and one Richards indicators, dynamometers, a Prony brake, Parr coal calorimeter, platform scales and other apparatus essential and accessory to experimental engineering.

A Hydraulic Laboratory has been fitted up in the basement of Old Engineering Hall. Water is supplied by about 700 feet of 8 inch and 10 inch cast iron pipe from the College elevated tank, of 163,000 gallons capacity. The available head is about 150 feet. Arrangements are made for measuring the loss of head from friction in the supply pipe and in its special castings. In the laboratory a tank is provided 50 feet long by 6 feet wide and 4 feet deep, which is used as a measuring and discharging tank for various pieces of apparatus, and which can also be used for experiments on the resistance of models to propulsion. The water is removed from this tank by two sewers; one 6 inches and the other 15 inches in diameter. These are arranged to be used for experiments on the laws of flow in sewer pipes. The laboratory is also provided with pipes of different sizes so arranged that measurements of the friction losses in these pipes and in their firings can be made. Additional apparatus in the nature of hy-
draulic motors, pumps of various types, and apparatus for experiments with orifices is being provided.

**Locomotive.** The Chicago & Northwestern railway has presented to the department an eight-wheel passenger locomotive and tender complete with attachments. The locomotive will be mounted for experimental work and will be a valuable addition to the laboratory equipment.

The principal dimensions of the locomotive are as follows:
- Cylinder, 16x24 inches.
- Drivers, diameter, 63 inches.
- Driving wheel base, 7 feet, 3 inches.
- Total engine wheel base, 21 feet, 3 inches.
- Total engine and tender wheel base, 42 feet, 3 inches.
- Total weight of engine, 70,000 pounds.
- Weight on drivers 40,000 pounds.

**CLASS ROOM WORK.**

In the class room the work is carried on by means of recitation and lectures, a text book and recitations being used wherever practicable; it is necessary, however, to present much material not found in text books, and in such cases recourse is had to the lecture system. Free use is made of the projection lantern and models.

**INSPECTION TRIPS.**

Once each year or oftener visits of inspection are made by the Senior class to power and manufacturing plants in Chicago and other large centers. These prove of great value to all.

**NON-RESIDENT LECTURES.**

Lectures by men in active engineering work are introduced from time to time and serve to add interest to the College work by bringing students and teachers in contact with the outside fields of engineering application.

**THESIS.**

So far as possible the graduating thesis is directed along lines which will produce results directly useful to the industrial interests of the State of Iowa, but this object is not furthered to the detriment of the student's interest to whom the thesis must be first of all an opportunity to think for himself and to apply
principles previously inculcated in the regular course of his studies.

Some recent theses in mechanical engineering are entitled:
Weathering of Iowa Fuels.
Design of Heating and Ventilating Plant for Morrill Hall.
Design of Central Heating Plant.
Design of Machine Shop.
Tests on Experimental Hot Blast Apparatus.
Design of Locomotive Testing Plant.
Tests of Steam Pipe Coverings.
Study of Combustion in Boiler Furnaces.
Constants of Locomotive Boilers.
Study of Hot Air Furnace Heating.

FEES.

All students taking shop work or engineering laboratory are required to pay a fee to defray the cost of materials, power, and breakage. The amount is specified in the description of the courses of study.

MECHANICAL ENGINEERING AT AMES AND THROUGHOUT THE STATE.

It is the desire of the department to be of all possible service to owners and operators of power stations for heat, light and power, of machine shops and of manufacturing plants in any line.

To this end correspondence is invited relating to problems on mechanical engineering lines and whenever inquiries by letter or in person indicate a need for investigation demanding the technical skill and equipment of the department the same will be undertaken if possible and the results furnished to all interested.

COURSES OF STUDY.

The following courses of study are given by the Department of Mechanical Engineering:


COURSE II.—Analytical Mechanics.—Four recitations per week, second term, Junior Year. Strength of Materials. Profes-
sor Meeker and Mr. Cleghorn. Text-book same as for Course I. Course I is a prerequisite.


Course IV.—*Steam Engine.*—Three lectures or recitations per week, second term, Junior Year. Theory and practical application thereof to the steam engine and other heat engines. Professor Dow. Text-book, *Thermodynamics of Heat Engines*, Reeve. Course XII, Physics III and IV and Mathematics are prerequisites.

Course V.—*Machine Design.*—Three lectures per week, first term, Junior Year. Elements of machine design. Professor Bissell. Simultaneous work in Courses I, XII and XXIV required. See also Course XXVIII.

Course VI.—*Hydraulics.*—Four recitations per week, first term, Senior Year. Professor Meeker. Text-book, same as for Course I. Courses I and II are prerequisites.

Course VII.—*Steam Engine Design.*—Three lectures per week, first term, Senior Year. A study of the principles involved in proportioning the cylinder dimensions of simple, compound and triple expansion engines and in the designing of fly-wheels, governors, valve-gears, engine shafts, etc. Professor Dow. Courses I, II, III and IV are prerequisites.

Course VIII.—*Specifications and Contracts.*—One lecture or recitation per week, first term, Senior Year. Professor Bissell. Text-book, *Engineering Contracts and Specifications*, Johnson.

Course IX.—*Constructive Engineering.*—Three lectures per week, second term, Senior Year. Principles of design and construction of heating, refrigerating, power, lighting and pumping plants in general and detail. Professor Bissell. Courses I, II, IV and XII are prerequisites.

Course X.—*Thesis.*—The equivalent of one hour per week, first term, Senior Year, and

Course XI.—*Thesis.*—The equivalent of five hours per week, second term, Senior Year, devoted to special work on an assigned topic. Professor Bissell. The thesis can be undertaken only by those students in the Department of Mechanical Engineering who have completed the prescribed course in Mechanical Engineering to the end of the Junior Year. The expenses of the thesis are adjusted by special arrangement in each case.
COURSE XII.—Engineering Laboratory.—One half day, first term, Junior Year, and

COURSE XIII.—Engineering Laboratory.—One half day per week, second term, Junior Year. Properties of materials, calibration of instruments, valve setting, indicator practice and efficiency tests of simple machines. Professor Meeker and Mr. Cleghorn. Text-book, Experimental Engineering. Carpenter. Physics II and IV and Chemistry III and VI are prerequisites. Fee, $3.00 for each course, XII and XIII.

COURSE XIV.—Engineering Laboratory.—Two half days per week, first term, Senior Year, and

COURSE XV.—Engineering Laboratory.—Two half days per week, second term, Senior Year. Efficiency test of stationary, and locomotive steam engines, gasoline and hot-air engines, boilers, refrigerating machinery and complete plants. Professor Bissell. Courses IV, XII and XIII are prerequisites. Fee, $5.00 for each course, XIV and XV.

COURSE XVI.—Seminar.—One hour per week, first term, and

COURSE XVII.—Seminar.—One hour per week, second term, Junior and Senior Years for students in Mechanical Engineering. Written papers on assigned topics with discussions thereof. Professors Bissell, Meeker and Dow.

COURSE XVIII.—Steam Engineering.—One lecture per week, with examinations at intervals, on the elementary principles of construction and operation of steam engines, boilers and accessory apparatus. Professor Bissell. Required of Freshmen in Mechanical Engineering, second term. Elective to Academic students in engineering.

COURSE XIX.—Free-Hand Drawing.—Four hours per week, second term, Academic Year. Use of pencil and pen in sketching from flat copies and from objects. Mr. Lawton.

COURSE XX.—Free-Hand Drawing.—Three hours per week, second term, Freshman Year. Free-hand, isometric, perspective and mechanical drawing of and from machine parts. Mr. Hadfield and Mr. Lawton. Course XIX or its equivalent is a prerequisite.

COURSE XXI.—Mechanical Drawing.—Six hours per week, first term, Freshman Year. The use of drawing instruments and practice in lettering. Mr. Hadfield and Mr. Lawton.

COURSE XXII.—Mechanical Drawing.—Six hours per week, first term, Sophomore Year. Working drawings, tracings and
blue-prints of complete machines and their details. Mr. Hadfield. Courses XX and XXI are prerequisites.

Course XXIII.—Kinematic Drawing.—One lecture and five hours drafting per week, second term, Sophomore Year. The relative motion of machine parts, including belting, gearing, cams and linkages. Mr. Hadfield. Course XXII is a prerequisite.

Course XXIV.—Designing.—Six hours per week, first term, Junior Year, and

Course XXV.—Designing.—Three hours per week, second term, Junior Year. Design of Steam Boilers. Text-book, Steam Boilers, Peabody and Miller. Also a study of the form, strength and proportions of the frames and moving parts of cranes and other machines, with detail drawings of same. Professor Dow. Text-book, Hand-book of Information, Cambria Steel Co. Courses XXII and XXIII are prerequisites and concurrent work in Courses I and II is required.

Course XXVI.—Designing.—Six hours per week, first term, Senior Year. Each student works out the design of a standard type of steam engine with especial attention to the design of the fly-wheel and governor for efficient speed regulation and obtains practice in laying out heating and ventilating plants. Professor Dow. Text-book, Mechanical Engineers' Pocket Book, Kent. Courses I, II, III, IV, XXIV and XXV are prerequisites and simultaneous work in Course VII is required.

Course XXVII.—Designing.—Six hours per week, second term, Senior Year. The design of complete machines of different types, including punching machinery, machine tools, special and automatic machinery. Attention is given to methods of construction as influenced by cost and other conditions. Practice in laying out power plants is given in connection with Course IX. Professor Dow. Courses I, II, III, IV and XXIV are prerequisites.

Course XXVIII.—Mechanical Engineering.—Two lectures per week, second term, Junior Year. Mechanical Engineering practice, shop construction, management and cost keeping. Professor Bissell. Courses V, XXIV and XXIX to XXXIII are prerequisites.

Course XXIX.—Shop-Work.—Eight hours per week for one term. Bench work and wood turning. Mr. Potter and Mr. King. Fee, $5.00.

Course XXX.—Shop-Work.—Eight hours per week for one term. Forge work, forging and welding iron and steel dressing and tempering tools. Mr. Knesche and Mr. Curl. Course XXIX is a prerequisite. Fee, $5.00.
Course XXXI.—Shop-Work.—Eight hours per week for one term. Pattern work, making patterns and core boxes for iron and brass castings, with allowances for draft, shrinkage and finish. Mr. Potter and Mr. King. Courses XXIX and XXXII are prerequisites. Fee, $5.00.

Course XXXII.—Shop-Work.—Eight hours per week, one term. Foundry work, moulding and casting in iron and brass, green and dry sand, cores, mixtures and alloys. Mr. Knesche and Mr. Curl. Fee, $5.00.

Course XXXIII.—Shop-Work.—Eight hours per week for one term,

Course XXXIV.—Shop-Work.—Eight hours per week for one term,

Course XXXV.—Shop-Work.—Eight hours per week for one term. Machine shop. Use of hand and machine tools for working iron, steel and brass, finishing and assembling of machines and parts thereof. Mr. Hummel and Mt. Otis. Courses XXIX, XXX, XXXI and XXXII are prerequisites. Fee, $5.00 for each course, XXXIII, XXXIV and XXXV.

ACADEMIC YEAR.

FIRST TERM.

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<td>Elocution, 2</td>
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(Mathematics, I.)
(English, I.)
(History, XV.)
(Language, X.)
(Language, XII.)
(Elocution, I.)
(Civics, I.)

SECOND TERM.

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(Mathematics, II or III.)
(Mathematics, V.)
(English, II.)
(Languages, XI.)
(Languages, XIII.)
(History, XVI.)
(Mechanical Engineering, XIX.)
(Mechanical Engineering, XVIII.)

*Elective upon consultation with Professor of Mechanical Engineering.
FRESHMAN YEAR.

FIRST TERM.

Advanced Algebra, 5
*French, 5, or
*German, 5
Advanced Rhetoric, 5
Shop-Work, 2
Mechanical Drawing, 2
History, Formative Periods, 1
Military Drill, 2
Library Work, 4 hours

(Mathematics, IV.)
(Languages, III.)
(Languages, VII.)
(English, III.)
(Mechanical Engineering, XXIX.)
(Mechanical Engineering, XXI.)
(History, XVII.)
(Military, I.)
(Library I.)

SECOND TERM.

Solid Geometry and Plane Trigonometry, 5
*French, 5, or
*German, 5
Composition, 1
Descriptive Geometry, 4
Machine Sketching, 1
Shop-Work, 2
Steam Engineering, 1
History, The American Nation, 1
Military Drill, 2

(Mathematics, VI.)
(Languages, IV.)
(Languages, VIII.)
(English, IV.)
(Civil Engineering, IV.)
(Mechanical Engineering, XX.)
(Mechanical Engineering, XXX or XXXII.)
(Mechanical Engineering, XVIII.)
(History, XVIII.)
(Military, II.)

SOPHOMORE YEAR.

FIRST TERM.

Analytical Geometry, 5
Physics, 5
Chemistry, 5
Shop-Work, 2
Mechanical Drawing, 2
Composition 1
Military Drill, 2

(Mathematics, VIII.)
(Physics, III.)
(Chemistry, III.)
(Mechanical Engineering, XXX, XXXI, or XXXII.)
(Mechanical Engineering, XXII.)
(English, V.)
(Military, III.)

SECOND TERM.

Calculus, 5
Physics, 5
Chemistry, 5
Shop-work, 2
Mechanical Drawing 2

(Mathematics, IX.)
(Physics, IV.)
(Chemistry, VI.)
(Mechanical Engineering, XXX, XXXI, or XXXII.)
(Mechanical Engineering, XXIII.)

*Elective on consultation with the Professor of Mechanical Engineering.
Junior Year.

First Term.

Analytical Mechanics, 4
Political Economy, 5
Electricity and Magnetism, 3
Machine Design, 3
Physical Laboratory, 1
Engineering Laboratory, 1
Designing, 2
Shop-Work, 2
Seminar, 1
*Debating, 1
*History, XIXth Century, 2

Second Term.

Analytical Mechanics, 4
Materials of Construction, 3
Dynamo Electric Machinery, 2
Mechanical Engineering, 2
Physical Laboratory, 2
Engineering Laboratory, 1
Designing, 1
Steam Engine, 3
Shop-Work, 2
Seminar, 1
*Debating, 1
*History, XIXth Century, 1

Senior Year.

First Term.

Steam Engine Design, 3
Hydraulics, 4
Designing, 2
Engineering Laboratory, 2
Shop-Work, 2
Physical Laboratory, 2
Specifications and Contracts, 1
Seminar, 1
Thesis, 1
*History, XIXth Century, 2

*Beginning September, 1904, Freshman French or German will be second year work.
## Constructive Engineering, 3
## Hydraulic Engineering, 3
## Electrical Engineering, 2
## Designing, 2
## Engineering Laboratory, 2
## Seminar, 1
## Thesis, 5

(Mechanical Engineering, IX.)
(Civil Engineering, XXII.)
(Electrical Engineering, XXXII.)
(Mechanical Engineering, XXVII.)
(Mechanical Engineering, XV.)
(Mechanical Engineering, XVII.)
(Mechanical Engineering, XI.)

### DEPARTMENT OF CIVIL ENGINEERING.

**ANSON MARSTON, PROFESSOR.**
**L. E. ASHBAUGH, ASSISTANT PROFESSOR.**
**F. C. FRENCH, ACTING ASSISTANT PROFESSOR.**
****ELMINA T. WILSON, ASSISTANT PROFESSOR.**
**J. E. STEWART, ASSISTANT.**

The Department of Civil Engineering has its headquarters in new Engineering Hall. The offices of the Department occupy rooms 311, 315 and 316 in the third story of the building. In addition, the Department has two large class-rooms and a combination drawing-room and class-room in the third story of the building, a large drawing-room 40 feet by 70 feet in the fourth story and an ample sized instrument room in the fourth story, besides a cement laboratory and a masonry laboratory in the first story. The Department also has the use, in common with the other Engineering Departments, of the photographic and blue print rooms in the fourth story, the large Engineering Museum in the third story, and the large Assembly Room in the second story. All of these rooms are finely furnished and equipped throughout.

In connection with the offices provision is made for the systematizing of all the work of the Department, and card indexes for correspondence, equipment, and for general engineering literature are provided.

In addition to the space occupied in the new Engineering Hall part of the equipment of the Department is placed in the old Engineering Building. Here are located the hydraulic laboratory and most of the apparatus for testing the materials of construction. In these lines of work the Departments of Civil Engineering and Mechanical Engineering co-operate.

**Absent on leave**
The Instrumental Equipment is nearly all kept in room 409 on the fourth floor where suitable cases and racks are provided for storing it in a systematic way. The instrumental equipment includes seven complete engineer’s transits, one plain transit, one astronomical transit, one plane table, one surveyor’s compass, one railroad compass, one solar compass, six traverse tables, four engineer’s levels, and numerous chains, tapes, rods, etc. The Department is also well supplied with minor instruments such as drawing instruments, clinometers, computing machines, planimeter, hand levels, etc. This equipment is being constantly added to from yearly appropriations.

In giving out the instruments for the field work in the Civil Engineering course the captain of each field party signs a receipt for all apparatus taken out, and upon return of the same these receipts are cancelled and kept on file. Students are required to return all apparatus in as good condition as when taken out.

Although the instrument room is located on the fourth floor of the building an electric elevator is provided, landing within a few steps of the door of the room, which makes access to the apparatus convenient.

The Cement Laboratory is located in the first story, occupying room 105. Stone topped tables are provided on three sides of this room on which the mixing and breaking of briquettes and similar work is done. On two sides of the room are provided tanks underneath these tables for the storage of briquettes. Investigations are constantly under way with cements and similar substances, so that ample storage room is required. Under the stone topped table on the other side of the room are provided cement bins for storing cement and standard sand.

A Fairbanks testing machine is used for breaking the briquettes. There is an ample supply of molds for making the briquettes and the usual apparatus is provided for testing soundness, fineness, and rate of setting.

The Masonry Laboratory occupies room 106 of the first floor. This room is intended for the testing of building materials, especially brick and stone. Laboratory tables are provided for microscopic work and other work in this line. Grinding apparatus is arranged for preparing specimens for crushing and other tests and is separated from the rest of the room by a glass enclosure, the dust from within which is removed to the outside of the building through a flue. It is intended to place a large testing machine in this laboratory.
The apparatus for freezing and thawing tests of brick and stone is also located here.

The Hydraulic Laboratory is located in the basement of the old Engineering Building. The quarters here are not very suitable but it is intended to improve them as soon as possible. Water is supplied by about 700 feet of 8 inch and 10 inch cast iron pipe from the college elevated tank of 163,000 gallons capacity. The available head is about 150 feet. Arrangements are made for measuring the loss of head from friction in the supply pipe and in its special castings. In the laboratory a tank is provided 50 feet long by 6 feet wide and 4 feet deep, which is used as a measuring and discharging tank for the various pieces of apparatus. The water is removed from this tank by two sewers, one 6 inches and the other 15 inches in diameter. These are arranged to be used in experiments on the laws of flow in sewer pipes. The laboratory is also provided with wrought iron pipes of different sizes, so arranged that measurements of friction losses in these pipes and in their fittings can be made. Additional apparatus in the nature of weirs, hydraulic motors and pumps of various types is provided.

Laboratory Facilities for other tests of the materials of construction are provided for in connection with the Mechanical Engineering Department in the old Engineering Building. The Civil Engineering Department owns an abrasion testing machine and, jointly with the Mechanical Engineering Department, a 100,000 pound Riehle testing machine. The Civil Engineering students also have the use of other testing machines belonging to the Mechanical Engineering Department.

Standard Engineering Plans.—The Department has a large collection of blue print plans of bridges, roof trusses, buildings and similar structures, which have been kindly donated by the principal corporations engaged in structural engineering throughout the country. In a similar way, the principal railway companies of the country have donated standard plans of railway structures; and many plans and specifications of water works, sewer systems, and other engineering work are also to be found in the Department's collection of standard plans. This collection is constantly being added to. It is arranged systematically in large drawers, in filing cases provided in connection with the office equipment. In the general arrangement, plans relating to the same subject are kept in the same drawer. In addition, a
card index is provided whereby any drawing in the collection can readily be found.

The Engineering Museum on the third floor of the new Engineering Hall, 60 feet in diameter, is intended for the joint use of all the Departments of Engineering. This room is completely supplied with museum cases, and space is provided in which will be placed large models of engineering structures. The collection of specimens for this Museum is just beginning, but the Civil Engineering Department has already a set of the full sized sections of wrought iron and steel commonly used in engineering structures and a collection of specimens of Iowa building brick, paving brick, building stone, and other building materials. The Museum collection will be extended as rapidly as possible.

Water Works and Sewage Disposal Plant.—The Civil Engineering Department designed and supervised the construction of the college water-works. The College water tower is the largest in the west. It was designed with special reference to its architectural appearance and cuts of it have been published in four of the books treating of the design of such structures. The pumping machinery is so arranged that college students can readily make tests of the efficiency of the apparatus as part of the class work.

The Civil Engineering Department has also designed and supervised the construction of the college sewage disposal system. This is the first purification plant installed in the state and has been very successful.

The water works system and sewage disposal plant are utilized, so far as possible, to furnish practical object lessons to the students in Hydraulic and Sanitary Engineering.

Experimental Investigations Helpful to State Interests.—In the general write-up for the Division of Engineering above will be found a description of the concerted work now being undertaken by the entire Division of Engineering in conducting investigations helpful to the industrial interests of the state of Iowa and in making the results of these investigations known to the public. On this account the general discussion on this same object which has been given in the write-up of the Civil Engineering Department for several preceding years is now omitted, and in place of it mention will be made of the special lines of work in this connection finished or now being carried on by the Civil Engineering Department.

One of the most important lines of work already carried out is the investigation of sewage disposal for Iowa. The college
plant for this purpose was the first to be constructed in the state and has now been in successful operation for nearly five years. It has been visited by the authorities of many Iowa cities and has been completely successful in every respect. It purifies an amount of sewage equal to the flow from the average Iowa town of from 2,500 to 3,000 people to such degree that the effluent is as clear, sparkling and odorless as the purest spring water. Many chemical and bacterial tests have shown it to be purer than the water in many wells which are used for drinking purposes. Special investigations are now being made on the subject of the proper methods of purifying creamery sewage. The Department is in receipt of many letters of inquiry from creameries of the state regarding this point. An experimental plant for the separate treatment of the sewage from the College creamery has been installed to determine the best solution of the problem. A small, inexpensive plant for the disposal of the sewage of one private house is also being operated and tested, which it is hoped may solve the problem encountered by house owners who have to install sanitary fixtures but do not have access to a sewer. In connection with this sewage disposal work the Departments of Botany and Agricultural Chemistry have all along co-operated with the Civil Engineering Department most cordially.

The Department has also been making very extensive tests of the paving brick of the state. Thousands of brick have been tested and the results are now ready to compile for publication. In connection with this work the Department has co-operated with the State Engineering Society in investigating the brick paving of the state. The head of the Department has been Chairman of a Committee which has prepared an exhaustive report relating to all the features of brick paving in Iowa.

The Department has also made extensive tests of dry press brick used in the state with the result that an Iowa brick stood at the head of the list. A bulletin giving the results of another series of tests of the common brick of the state is now ready for distribution.

Concrete blocks and sand-lime brick have also been tested, and the results are in demand from all over the country.

The Department has also made tests of Iowa gypsum in comparison with similar materials from other states, and of Iowa building stone.

The Department calls the attention of the clay workers, quarry owners, municipal officers, officers of corporations engaged
in transportation or manufacturing, and of all others having to deal with the materials of construction, to the facilities afforded in its laboratories for making tests of such materials. Such work will be done for citizens of the state at the lowest possible rate. It will pay all such persons to have the good quality of their cement, brick, or building stone, established by tests. The same is true of the steel for the bridges and water towers of the state. The facilities of the laboratories of the Civil Engineering Department are offered for such purposes.

Another valuable field which has not been developed in Iowa is that of good roads. The Civil Engineering Department is now conducting good roads investigations. During the past and present year many data have been collected regarding the cost of transportation over country roads, and of the amount of money which could economically be expended in improving the roads. Tests of the resistance to hauling on different kinds of road and under different conditions of weather are also being made. These investigations will be continued and extended. The character and cost of materials available for making roads in different parts of the state will be studied, as also the best methods of road administration. Data as to the present expenditure for road purposes in all Iowa counties are also being collected.

Bulletins.—Six Bulletins have already been prepared, relating to sewage disposal and can be obtained on application. A Bulletin relating to tests of building brick is also ready for distribution, together with the Report on Brick Paving prepared by the Committee of the State Engineering Society. Additional Bulletins relating to all the lines of work of the Department will be published from time to time.

As illustrating some of the recent lines of investigation work in the Department the titles of some of the Senior Theses for the present year are given as follows:

"Investigations Relating to Good Roads in Iowa."
"Statistics of Iowa Ordinances Relating to Sewers, Waterworks and Plumbing."
"The Flow of Underground Water."
"Tests of Concrete."
"A Sewage Disposal Plant for a Private House."

The Alumni of the Department.—The Civil Engineering Department of the Iowa State College is proud of the record made by its Alumni, in all branches of Civil Engineering, as shown by
their eminence as engineers. They are to be found located in responsible positions throughout this country and abroad. The Department maintains an Alumni Directory and endeavors to keep in touch, so far as possible, with its graduates. It is often the case that the Department is able to be helpful to the Alumni by recommending them for positions. The Department receives more and more calls for men to fill good positions. Many of these calls come from the older Alumni themselves.

Of recent years the demand upon the Department for men to fill good positions has continually been greater than the supply.

COURSE OF STUDY.

One of the most eminent of American engineers has said, "The civil engineer of the new epoch must be an educated man. In no profession will this be more necessary." The work of the course of study in Civil Engineering has been arranged to give as thorough a training as practicable in those fundamental subjects, a knowledge of which must form the foundation of the equipment of the competent civil engineer. The work may be classified under the heads, Culture Studies, Mathematical Studies, Science Studies, and Professional Studies.

Culture Studies include History, English, French or German, and Political Economy. Thorough work in English is especially necessary in the training of the engineer to enable him to express himself with the utmost clearness and conciseness, in his reports and in papers on technical subjects. No one can attain great success as an engineer who fails in these particulars. His success in carrying out projects upon which he is engaged will often depend upon his ability to convince his superiors or public officials of the correctness of his views. The really successful engineer also must come in close contact with other members of his profession, and must exchange information of value with them through the medium of papers on technical subjects. For the attainment of these ends the engineer should give especial attention to the thoroughness of his training in English. The work in English begins in the Academic year and continues to the end of the Sophomore year. Much training in the writing of essays is given, and the last three terms are devoted wholly to this kind of work, which is of special importance to the engineer. A course in debating is offered throughout the Junior year which all students who can do so are advised to elect. It is of importance to the engineer to be able to express himself creditably orally as well as
in writing. The drill in English is continued to some extent throughout the Junior and Senior years by the work in the Engineering Seminar, which requires careful preparation of papers on professional subjects.

The work in pure mathematics continues throughout the Academic, Freshman and Sophomore years, and includes instruction in Algebra, Plane and Solid Geometry, Plane and Spherical Trigonometry, Analytical Geometry and Calculus. Thorough preparation in mathematics is one of the most essential things in an engineer's education, and without it he can never pass beyond the mere workman stage in his profession. It is especially necessary that he should be able to apply his knowledge of mathematics with facility to the actual problems he encounters in his professional work. Hence the instruction in mathematics is specially directed to giving facility in the solution of problems. The work in pure mathematics is supplemented in the Freshman year by a course in Descriptive Geometry, which gives the application of mathematics to draughting, and in the Junior and Senior years by thorough courses in Analytical Mechanics, Strength of Materials, and Hydraulics, which give the mathematical applications of physical laws to the designing of engineering structures and to the study of the laws of liquids. Practical Astronomy is studied in the second term of the Senior year.

The successful engineer must also be thoroughly familiar with the scientific principles relating to the laws and forces of nature which he must use in his professional work. Instruction in the physical sciences begins with Chemistry and Physics in the Sophomore year. Geology is taught in the Senior year. The College laboratories are especially well fitted for giving training in scientific work. It is by a study of scientific subjects supplemented by laboratory work that the engineer becomes familiar with those sources of power in nature which it is his life work to direct for the use and convenience of man.

For detailed information as to the nature of the professional work given in the course in Civil Engineering the reader is referred to the statements regarding each specific subject under the head of "Courses" below. It may be said here in a general way that the instruction in Free-Hand Drawing begins in the Academic year. Mechanical Drawing, Lettering, the use of Water Colors and Pen Topography are studied in the Freshman year. Shades and Shadows and Perspective are studied in the Sophomore year. In the course of instruction in Drawing it is at-
tempted to give the student such facility in drawing that he can do creditable work in an engineering draughting office. Especial attention is paid to the lettering of all drawing, both in the direct class work in Lettering, and in the finishing up of all other drawings made in connection with his other professional work. The student is required to letter them plainly and neatly and to make finished plates. Throughout the Sophomore, Junior and Senior years the student has practice in the preparation of maps and of drawings and plans of various engineering structures.

The work in Field Surveying practice begins in the Freshman year and continues for three years, seven hours per week for fourteen weeks of each term. The student serves in a subordinate position until he becomes familiar with the instruments and the work, and finally he has charge of a small party. He becomes familiar with land surveying, leveling, topographical surveying and railway surveying by actual work in the field. It is the aim of the course to give the student the facility in the handling of instruments and in the carrying out of operations in field surveying which can only be acquired by considerable practice. It is also attempted to give him as much experience as possible in the handling of small parties of men. Besides the above work students actually camp in the field for two weeks and a half in each of three summer vacations, and so become familiar with topographical work on a more extended scale. In lieu of this summer surveying many students obtain remunerative work with engineers throughout the summer vacation. Such work, when properly certified to by the engineer under whom it is taken, is accepted in lieu of the summer camp surveying. Students are encouraged and urged to secure positions of this kind, as it not only assists them financially, but also is of great benefit to them in connection with their professional training.

A course of instruction in Land and Topographical Surveying runs throughout the Sophomore year and one in Railway Engineering runs throughout the Junior year.

Electric Railways and Power Transmission are also studied in the Junior year.

Instruction in Roads and Pavements is given in the second term of the Senior year. Sanitary Engineering, Water Works Engineering, Bridge Engineering, and Masonry Structures and Foundations are taught in the Senior year. For the details of each of these courses reference should be made to the information given below under the specific course named. The designing
of engineering structures by the student begins in the second term of the Junior year and continues throughout the Senior year. In this work the student actually designs roof trusses and stone and steel truss bridges, preparing the working drawings. A course of actual practice in testing the various materials of construction in the Engineering Laboratory is given in the Junior and Senior years, and is of great value in familiarizing the student with methods of testing and with the properties of the materials of construction.

A valuable part of the work of the course is not laid out on paper, but is gained by inspection of engineering work on the inspection tours arranged for the upper classmen. It is planned at least once a year to have the Junior and Senior students go on an inspection trip to some point where various engineering works can be inspected and their instructive features noted. In 1901 the trip was to Chicago, and in 1902 to Minneapolis and St. Paul.

Valuable instruction is also obtained by listening to lectures given by non-resident lecturers. Practicing engineers are invited to the College to give lectures to the engineering students upon the subjects in which they are experts. During the past year lectures have been given by Prof. Elwood Mead, Immigration Expert, U. S. Agricultural Dep't., by C. J. Elliott, drainage expert in the same department, and by G. W. Catt, of New York, President of the Atlantic, Gulf & Pacific Dredging Co.

The work of the course finally culminates in the thesis, an original investigation carried on by the student to demonstrate his ability to do such work before he graduates. In the past large amounts of time have been devoted by students as a rule to this work, and it has often been the case that the results have been found worthy of publication. Each student should attempt to make his thesis one of the things of which he can justly be proud throughout the remainder of his professional career.

The following courses of study are given by the Civil Engineering Department:

Course I.—Lettering.—Three hours per week throughout the first term, Freshman Year. Text-book, Reinhardt's "Lettering for Draughtsmen, Engineers and Students." The work consists in the preparation of practice plates of lettering and titles, and in actual practice in lettering and engineering drawings. Mr. Stewart.

Course II.—Field Work.—Seven hours per week for fourteen
weeks during the first term, Freshman Year. Fee $2.00. See Course III. Professor Ashbaugh and Mr. Stewart.

Course III.—Field Work.—Seven hours per week for fourteen weeks during the second term, Freshman Year. In Courses II and III the men are assigned to do duty as chainmen, axemen and rodmen in the squads in Sophomore Surveying and Junior Railway Surveying, of which Sophomores and Juniors have charge, besides serving as instrument men. A fee of $2.00 is charged to pay for stakes, ordinary wear of instruments, etc. Professor Ashbaugh and Mr. Stewart.

Note. The work in Courses II and III is preparatory to the Field Work of the Sophomore and Junior years, which takes the same number of hours per week each year. Thus the student has the training to be obtained by three years' actual experience in the field. He begins in a subordinate position, but for a part of the time he is in responsible charge of a small party.

Course IV.—Descriptive Geometry.—Two recitations and six hours drawing per week throughout the second term, Freshman year. Text-book, MacCord's "Descriptive Geometry." Many original problems are also solved in class and in the draughting room. This course is open to students who have completed Mechanical Drawing, Plane Geometry, and second term Academic Geometry and Trigonometry. Professor Wilson, and Mr. Stewart.

Course V.—Drawing. Tinting and Shading and Pen Topography.—Six hours per week throughout the second term, Freshman Year. The work consists in practice with water colors (occupying about one-half of the total time), and of making practice plates illustrating the use of topographical symbols, contours and hatchings, during the remainder of the time. This course is open to the students who have completed Free Hand Drawing. Professor Wilson and Mr. Stewart.

Course VI.—Drawing. Shades and Shadows.—Three hours per week throughout the first term, Sophomore Year. The drawing consists in the solution of problems, with various sources of light, and is based on the principles of Descriptive Geometry. This course is open to students who have completed Course IV. Professor Wilson.

Course VII.—Drawing. Perspective.—Three hours per week throughout the second term, Sophomore Year. Text-book, Lawrence's "Principles of Perspective." The drawing consists partly in the solution of problems and in sample exercises in Perspective and partly in the preparation and architectural rendering of a perspective drawing of a building or engineering structure, from the detailed plans. This course is open to students who
have completed Descriptive Geometry, Mechanical Drawing, and Tinting and Shading. Professor Wilson.

Course VIII.—Surveying.—Two recitations and seven hours field work per week throughout the first term, Sophomore Year, in the Civil Engineering course, and throughout the first term, Junior Year in the Agricultural course. Text-books, Johnson's "Theory and Practice of Surveying" and Elliott's "Engineering for Land Drainage." The topics treated in the class-room are the use and care of surveying instruments, problems in surveying including methods of calculating areas of tracts of land, the study of the United States public land surveys with special reference to the restoration of lost or obliterated corners and sub-division of sections, the best methods of doing field work and keeping notes for the same, and the making of maps and profiles.

The study of Drainage Engineering demands special attention in this state and the course is adapted to such needs. The principles of the subject receive careful attention in the class room and are put into immediate practice in the investigation of various tracts of land in the vicinity of the College where development by drainage is advisable. The thorough drainage of individual farms is considered, and also the engineering and legal methods employed on large districts under county control. The usual reports of the engineer are required from each student, including complete maps and profiles, estimates of cost, and the report of the Commission on the assessment of the various properties.

The field work, which occupies seven hours each week for fourteen weeks, gives practice in the use and adjustment of surveying instruments, various methods of careful measurements with tapes, and with transit and level, exact methods of triangulation, and the making of surveys for maps and profiles. The data used in the land survey practice are obtained from official records at the County Recorder's Office. The usual office work of making maps and profiles for surveys is carried out by each student. Frequent reference is made to the best engineering periodicals and the students prepare abstracts of articles of interest as the topics are studied in the class room. While the aim of this course is to hold rigidly to exact methods consistent with results required and to give the student a broad knowledge of principles of surveying, at the same time he is taught to use the best methods employed in the best engineering offices that he may be
ready to fall in line with his associates on entering his actual practice. This course is open to students who have completed Geometry and Plane Trigonometry. A fee of $3.00 is charged to pay for stakes, ordinary wear of instruments, etc. Professor Ashbaugh and Mr. Stewart.

Course IX.—Surveying.—Two recitations and seven hours field work per week throughout the second term, Sophomore Year. Text-book, Johnson’s “Theory and Practice of Surveying.” This is a continuation of Course VIII, the topics treated in the class room being Topographical Surveying, Hydrographic Surveying, Mining Surveying, City Surveying, and Geodetic Surveying. The field work, which occupies seven hours per week for fourteen weeks, continues the work of the first term, to which is added extensive practice in Topographical Surveying, including the construction of an accurate map from the survey notes. Fee $3.00. Professor Ashbaugh and Mr. Stewart.

Course X.—Railway Engineering.—Three recitations and seven hours field work per week throughout the first term, Junior Year. See Course XI. For one of the recitations three hours office work are substituted during part of the term. A fee of $3.00 is charged for stakes, ordinary wear of instruments, etc. Professors Marston and French.

Course XI.—Railway Engineering.—Three recitations and seven hours field work per week, throughout the second term, Junior Year. For one of the recitations three hours office work are substituted during part of the term. Fee $3.00.

For Courses X and XI the text-books are Searle’s “Field Engineering,” Crandall’s “Transition Cures,” ”Tratman’s “Railway Track and Track Work,” and Professor Marston’s and Professor French’s Notes. In the Notes, practical details of railroad location and construction are given, standard plans for railway structures are given and discussed, and the economic theory of railway location is treated at some length. In the text-books some of the topics are simple, compound and transition curves, the location and construction of railways, track standards and maintenance, etc. In the field work a preliminary survey of about four miles of railway is made, from which a contour map is prepared. On this a “paper location” is laid down, after a careful study to determine the best route. This located line is then run in the field and cross sectioned. The grading is calculated, bills of material for culverts
and bridges are made, bridges are staked out, and the cost of the line is estimated. This course is open to students who have completed Geometry, Plane Trigonometry, and Courses VIII and IX. Professors Marston and French.

Course XII.—Roads and Pavements.—Two recitations per week throughout the second term, Senior Year, in the course in Civil Engineering. Text-book, Baker’s “Roads and Pavements” and Tillson’s “Pavements.” Among the topics studied are the good roads problem, the best method of constructing country roads, city streets and grades, classes and methods of construction of pavements, and the costs of roads and pavements. Professor Marston.

Course XIII.—Roads and Pavements.—Two recitations throughout the second term, Junior Year in the course in Agriculture. Text-book, Baker’s “Roads and Pavements.” The work is similar to that in Course XII except that during the latter part of the term less attention is paid to city pavements and in place of this the class will undertake field and office work in connection with road improvement such as making survey of road, preparing map and profile of improvement, staking out the work, and estimating the cost. Professor Marston.

Course XIV.—Engineering Laboratory.—Six hours per week throughout the second term, Junior Year. Fee, $5.00. The work is done in the testing laboratories, and consists in making the various standard tests of the materials of construction, including cement, building stone, paving brick, wood, cast iron, wrought iron, and steel. This course is open to Juniors. Professor Wilson.

Course XV.—Engineering Laboratory.—Three hours per week throughout the first term, Senior Year. Fee, $3. The work consists of special investigations in the hydraulic or testing laboratory on subjects selected after consultation with the instructor. This course is open to Seniors who are at the same time studying hydraulics. Professor Wilson.

Course XVI.—Engineering Laboratory.—Three hours per week throughout the second term, Senior Year. Fee, $3.00. The work consists of special investigations in the hydraulic or testing laboratory on subjects selected after consultation with the instructor. This course is open to students who have completed Courses XIV and XV. Professor Wilson.

Course XVII.—Designing, Structural.—Two lecture hours and four hours designing per week throughout the second term,
Junior year. Text-book, Ketchum's "Steel Mill Buildings." A study of stresses in Roof Trusses and Mill Buildings, followed by the design of the Building and complete shop details of the Roof Truss and parts of the columns, Crane Girders, etc. In stress calculations graphic analysis is largely used and checked by the algebraic methods. Several leading types of trusses, monitors, roof and wall coverings, etc., are considered, thus furnishing many different subjects for the designs. It is the aim of this course to give the student such practice in the use of the Standard hand books, methods of design, and the making of shop drawings, that he may be of some service in the drawing room of a bridge company during the summer vacation. Students are urged to secure such practice, when possible, during the vacation preceding the work of the Senior year. This course is open to students who have completed the first term Junior work in Analytical Mechanics, and are pursuing simultaneously the second term Junior work in the same subject. Professor Ashbaugh.

Course XVIII.—Framed Structures.—Three recitations and six hours designing per week during the first term, Senior year, continuing Course XVII. Professor Ashbaugh.

Course XIX.—Framed Structures.—Three recitations and nine hours designing per week during the second term, Senior year, continuing Course XVIII.

For Courses XVIII and XIX, the text-books are Johnson's "Framed Structures," Merrilman and Jacoby's "Roofs and Bridges," and Ketchum's "Steel Mill Buildings," with special notes in mineograph and blue print form. The classroom work consists in the study of methods for computing the stresses, proportioning members, designing joints, etc., for bridge and roof trusses and other framed structures. Many problems in stresses are worked out including various types of simple bridge and roof spans, cantilevers, two and three hinged arches, draw bridges, towers, etc. A complete design of a bridge is also given preparatory to the drawing room work.

During the past year the work in designing has been as follows, each student working independently and usually on a design different from all others, complete design and shop details of a short plate girder, a pin connected through highway bridge, a riveted lattice girder, and a long plate girder of special type, also design and show drawing of a steel water tank and tower. Professor Ashbaugh.
COURSE XX.—**Stereotomy.**—Six hours per week throughout the first term, Senior Year. Text-book, Crandall’s “Stereotomy.” The work consists in actually designing a stone or brick and a concrete-steel arch bridge. This course is open to students who have completed Mechanics. Professor French.

COURSE XXI.—**Sanitary Engineering.**—Three recitations per week throughout the first term, Senior Year. Text-book, Folwell’s “Sewerage,” and Professor Marston’s Notes. The work consists in the study of the principles and methods involved in the design, construction and maintenance of sewerage systems. House plumbing and sewage disposal are studied in the Notes. Professor Marston.

COURSE XXII.—**Hydraulic Engineering.**—Three recitations per week throughout the second term, Senior Year, on the principles and methods involved in the design, construction and maintenance of water works systems. Text-book, Turneaure and Russell’s “Water Supply Engineering.” Professor Marston.

COURSE XXIII.—**Masonry Structures.**—Four recitations per week throughout the first term, Senior Year. Text-book, Baker’s “Masonry Structures.” The work consists in the study of principles involved in the design and construction of foundations, and in the design, construction and maintenance of all classes of masonry structures. Professor Marston.

COURSE XXIV.—**Practical Astronomy.**—Four recitations and three hours field work per week for the last ten weeks of the first term, Junior Year. Required, Mathematics VII and IX. The work covers the ordinary methods of determining latitude, longitude, and time, with their applications to Geodetic Surveying. Text-book, Hayford’s “Geodetic Astronomy.” Professor Wilson.

COURSE XXV.—**Thesis.**—Credit equivalent to one recitation per week throughout the first term, Senior Year, is given for the thesis work required during that term. See Course XXVI. Professor Marston.

COURSE XXVI.—**Thesis.**—Credit equivalent to three recitations per week throughout the second term, Senior Year, is given for the thesis work required that term. The credits for thesis, Courses XXV and XXVI, require at least three hours per week thesis work throughout the first term, Senior Year, and nine hours per week throughout the second term, Senior Year. Students are required to put in as much additional time as may be necessary to thoroughly work up the subject chosen, and to prepare a well-digested and complete write-up of the results.
Junior year. Text-book, Ketchum's "Steel Mill Buildings." A study of stresses in Roof Trusses and Mill Buildings, followed by the design of the Building and complete shop details of the Roof Truss and parts of the columns, Crane Girders, etc. In stress calculations graphic analysis is largely used and checked by the algebraic methods. Several leading types of trusses, monitors, roof and wall coverings, etc., are considered, thus furnishing many different subjects for the designs. It is the aim of this course to give the student such practice in the use of the Standard hand books, methods of design, and the making of shop drawings, that he may be of some service in the drawing room of a bridge company during the summer vacation. Students are urged to secure such practice, when possible, during the vacation preceding the work of the Senior year. This course is open to students who have completed the first term Junior work in Analytical Mechanics, and are pursuing simultaneously the second term Junior work in the same subject. Professor Ashbaugh.

COURSE XVIII.—Framed Structures.—Three recitations and six hours designing per week during the first term, Senior year, continuing Course XVII. Professor Ashbaugh.

COURSE XIX.—Framed Structures.—Three recitations and nine hours designing per week during the second term, Senior year, continuing Course XVIII.

For Courses XVIII and XIX, the text-books are Johnson's "Framed Structures," Merriman and Jacoby's "Roofs and Bridges," and Ketchum's "Steel Mill Buildings," with special notes in mineograph and blue print form. The class room work consists in the study of methods for computing the stresses, proportioning members, designing joints, etc., for bridge and roof trusses and other framed structures. Many problems in stresses are worked out including various types of simple bridge and roof spans, cantilevers, two and three hinged arches, draw bridges, towers, etc. A complete design of a bridge is also given preparatory to the drawing room work.

During the past year the work in designing has been as follows, each student working independently and usually on a design different from all others, complete design and shop details of a short plate girder, a pin connected through highway bridge, a riveted lattice girder, and a long plate girder of special type, also design and show drawing of a steel water tank and tower. Professor Ashbaugh.
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Course XXV.—Thesis.—Credit equivalent to one recitation per week throughout the first term, Senior Year, is given for the thesis work required during that term. See Course XXVI. Professor Marston.

Course XXVI.—Thesis.—Credit equivalent to three recitations per week throughout the second term, Senior Year, is given for the thesis work required that term. The credits for thesis, Courses XXV and XXVI, require at least three hours per week thesis work throughout the first term, Senior Year, and nine hours per week throughout the second term, Senior Year. Students are required to put in as much additional time as may be necessary to thoroughly work up the subject chosen, and to prepare a well-digested and complete write-up of the results.
Most students devote much extra time to the work. The subject chosen must be one requiring original work. It may be the study and design of some engineering project (including the surveys), the investigation of some engineering question, or an experimental investigation. Professor Marston.

Course XXVII.—Engineering Seminar.—Credit is given equivalent to one recitation per week, first term, Junior Year. See Course XXX. Professor Marston.

Course XXVIII.—Engineering Seminar.—Credit is given equivalent to one recitation per week, second term, Junior Year. See Course XXX. Professor Marston.

Course XXIX.—Engineering Seminar.—Credit is given equivalent to one recitation per week, first term, Senior Year. See Course XXX. Professor Marston.

Course XXX.—Engineering Seminar.—Credit is given equivalent to one recitation per week, second term, Senior Year.

The Civil Engineering Seminar, Courses XXVII to XXX, inclusive, meets once each week, while College is in session, and has for its members the Professors and the Instructors in Civil Engineering, and all students in the Junior and Senior classes in the course in Civil Engineering. At each meeting five students give "journal reviews" of the most timely articles and topics found in the current numbers of the technical journals, a large number of which are regularly taken by the College Library. Another student then reads a paper on some engineering subject. Both the journal review and the paper are discussed by the other members of the Seminar. The subjects for the papers follow a regular, connected program, arranged in advance for each term. Professor Marston.

Course XXXI.—Summer Surveying.—Fifteen entire days' work in the field in the summer vacation following the Freshman year. See Course XXXIII. Professors Marston, Ashbaugh, French and Mr. Stewart.

Course XXXII.—Summer Surveying.—Fifteen entire days' work in the field in the summer vacation following the Sophomore year. See Course XXXIII. Professors Marston, Ashbaugh, French and Mr. Stewart.

Course XXXIII.—Summer Surveying.—Fifteen entire days' work in the field in the summer vacation following the Junior year. Professors Marston, Ashbaugh, French and Mr. Stewart.

In the work of Courses XXXI to XXXIII, inclusive, the
Professors of Civil Engineering and the students in the Course in Civil Engineering go into camp for fifteen days each summer vacation, beginning the Saturday before Commencement, and conduct an organized topographical survey of some region in the state. Each year’s work continues that of the preceding year, until a large area is mapped. At present a strip about three miles wide, half on each side of the Des Moines river, south of Boone, is being mapped. Lower classmen will serve in subordinate positions. Upper classmen will have responsible charge of parties, and will do the triangulating and final mapping. All camp equipage, including tents and cooking utensils, will be furnished by the College. Students must pay their own traveling and living expenses. A corps of student officers has direct charge of the work, part of these officers being elected by the students and part appointed by the Department. It is one of the greatest honors in the course in Civil Engineering to be chosen on this corps of officers. The list of student officers for the summer camp of 1903 was as follows:

Chief Engineer—J. Q. Wickham.
Assistant Chief Engineer—H. F. Anthony.
Computer—C. E. Shipman.
Chief Draughtsman—B. R. Wallace.
Junior Commissary—M. J. Warden.
Sophomore Commissary—C. J. Crawford.

COURSE IN CIVIL ENGINEERING.

ACADEMIC YEAR.

FIRST TERM.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Algebra</td>
<td>5</td>
</tr>
<tr>
<td>English</td>
<td>5</td>
</tr>
<tr>
<td>History</td>
<td>4</td>
</tr>
<tr>
<td>French, or German</td>
<td>3</td>
</tr>
<tr>
<td>Elocution</td>
<td>2</td>
</tr>
<tr>
<td>*Field Work</td>
<td>2</td>
</tr>
<tr>
<td>Civics</td>
<td>2</td>
</tr>
</tbody>
</table>

*Field Work in the Academic year is optional but all students are urged to take it with a view to preparing to secure remunerative engineering work during the summer vacations.

SECOND TERM.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Mathematics, I.)</td>
<td></td>
</tr>
<tr>
<td>(English, I.)</td>
<td></td>
</tr>
<tr>
<td>(History, XV.)</td>
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<tr>
<td>(Languages, X.)</td>
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<tr>
<td>(Languages, XII.)</td>
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<tr>
<td>(Elocution, I.)</td>
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<tr>
<td>(Civil Engineering, II.)</td>
<td></td>
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<tr>
<td>(Civics, I.)</td>
<td></td>
</tr>
<tr>
<td>(Mathematics, II or III.)</td>
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</table>
**Plane Geometry, 5**
**Elementary Rhetoric, 5**
**History, 2**
**French, 3, or**
**German, 3**
**Drawing, 2**
**Field Work, 2**

**FIRST TERM.**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Advanced Algebra</td>
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<tr>
<td>French, 5, or</td>
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<tr>
<td>German, 5</td>
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<tr>
<td>Advanced Rhetoric</td>
<td>5</td>
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<tr>
<td>History, Formative Period</td>
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</tr>
<tr>
<td>Mechanical Drawing</td>
<td>2</td>
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<tr>
<td>Lettering</td>
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<tr>
<td><strong>Field Work, 2</strong></td>
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<tr>
<td>Military Drill</td>
<td>2</td>
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<tr>
<td><strong>Shop Work, 2</strong></td>
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<tr>
<td>Library Work, 4 hours</td>
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**SECOND TERM.**

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>Solid Geometry and Plane Trigonometry, 5</td>
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<tr>
<td>French, 5 or</td>
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<tr>
<td>German, 5</td>
<td></td>
</tr>
<tr>
<td>Composition, 1</td>
<td></td>
</tr>
<tr>
<td>History, The American Nation, 1</td>
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<tr>
<td>Descriptive Geometry</td>
<td>4</td>
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<tr>
<td>Drawing, 2</td>
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<tr>
<td>Machine Sketching</td>
<td>1</td>
</tr>
<tr>
<td><strong>Field Work, 2</strong></td>
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</tr>
<tr>
<td>Military Drill</td>
<td>2</td>
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<tr>
<td><strong>Shop Work, 2</strong></td>
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<tr>
<td>***Summer Surveying</td>
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</table>

**SOPHOMORE YEAR.**

**FIRST TERM.**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical Geometry</td>
<td>5</td>
</tr>
<tr>
<td>Physics, 5</td>
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</tbody>
</table>

*Beginning in September, 1904, the French or German in the Freshman year will be second year work.*

**Students who have completed Field Work can elect Shop Work.**

***All students in Civil Engineering go into camp fifteen days each summer vacation and conduct an organized topographical survey.***
Surveying, 4  (Civil Engineering, VIII.)
Chemistry, 5  (Chemistry, III.)
Drawing, 1  (Civil Engineering, VI.)
Composition, 1  (English, V.)
Military Drill, 2  (Military, III.)

SECOND TERM.
Calculus, 5  (Mathematics, IX.)
Physics, 5  (Physics, IV.)
Surveying, 4  (Civil Engineering, IX.)
Chemistry, 5  (Chemistry, VI.)
Drawing, 1  (Civil Engineering, VII.)
Composition, 1  (English, VI.)
Military Drill, 2  (Military, IV.)
*Summer Surveying, 2 1-2 week  (Civil Engineering, XXXI.)

JUNIOR YEAR.

FIRST TERM.
Spherical Trigonometry, 2  (Mathematics, XII.)
Analytical Mechanics, 4  (Mechanical Engineering, I.)
Electric Railways and Power Transmission  (Electrical Engineering, XXXI.)
Practical Astronomy, 3  (Civil Engineering, XXIV.)
Railway Engineering, 5  (Civil Engineering, X.)
Physical Laboratory, 2  (Physics, XIV.)
Seminar, 1  (Civil Engineering, XXVII.)
***History, XIXth Century, 2  (History, VII.)
**Debating, 1  (English, VII.)

SECOND TERM.
Analytical Mechanics, 4  (Mechanical Engineering, I.)
Material of Construction, 3  (Mechanical Engineering, III.)
Railway Engineering, 5  (Civil Engineering, XI.)
Political Economy, 5  (Economic Science, I.)
Structural Designing, 2  (Civil Engineering, XVII.)
Engineering Laboratory, 2  (Civil Engineering, XIV.)
Seminar, 1  (Civil Engineering, XXVII.)

*All students in Civil Engineering go into camp fifteen days each summer vacation and conduct a topographical survey.
***Elective in either term of Junior or Senior year, subject to approval of Professor of Civil Engineering
**Elective, subject to approval of Professor of Civil Engineering.
**Debating, 1** (English, VIII.)

**History, XIXth Century, 2** (History, VIII.)

*Summer Surveying, 2 1-2 weeks,* (Civil Engineering, XXXIII.)

In place of the two and a half weeks' summer surveying for any year there may be substituted not less than four weeks' actual engineering work done for some competent engineer, a reputable firm, or department engaged in engineering work.

**SENIOR YEAR.**

**FIRST TERM.**

Framed Structures, 5  
Hydraulics, 4  
Masonry Structures and Foundations, 4 (Civil Engineering XXII.)  
Stereotomic, 2  
Engineering Laboratory, 1  
**History, XIXth Century, 2**  
Thesis, 1  
Seminar, 1

**SECOND TERM.**

Framed Structures, 6  
Geology, 4  
Roads and Pavements, 2  
Hydraulic Engineering, 3  
Engineering Laboratory, 1  
**History, XIXth Century, 2**  
Thesis, 3  
Seminar, 1

**DEPARTMENT OF ELECTRICAL ENGINEERING.**

**LOUIS BEVIER SPINNEY, PROFESSOR.**
**B. S. LANPHEAR, ASSISTANT PROFESSOR.**
**G. N. MERENESS, ASSISTANT.**

This department aims to meet the needs of young men who have in mind the practice of electrical engineering in any of its various applications in the business world.

It has been outlined with a view to securing for the student a thorough drill in those sciences, the principles of which underlie

**All students in Civil Engineering go into camp fifteen days each summer vacation and conduct an organized topographical survey.**

**Elective, subject to approval of Professor of Civil Engineering.**

**Elective in either term of Junior or Senior year, subject to approval of Professor of Civil Engineering.**
all electrical engineering practice, to secure for him a training in the application of scientific principles to the solution of practical problems in engineering and to familiarize him with such methods of the laboratory and testing room as are available for practical and commercial determinations.

The sciences of Mathematics, Physics and Chemistry, are emphasized, as it is believed they are of first importance in such a course. The attention of the student is directed to the value of these subjects and he is urged to give them his most careful consideration.

In recognition of the fact that a knowledge of Mechanical Engineering is essential to many electrical engineering operations a large part of the student's time is devoted to a training in this direction. The mechanical engineering work required of students in this course, includes mechanical drawing, shop-work, kinematics, machine design, analytical mechanics, hydraulics, materials of construction, engineering laboratory and the study of the steam engine.

Mechanical Drawing is taken up in the first term of the Freshman year and extends through the Sophomore year.

Shop-Work extends to the end of the Junior year and includes work in the carpenter shop, in the forge shop and foundry and in the machine shop.

In the course in Engineering Laboratory the work consists in the tests of strength of materials, viscosity of oils, efficiency of belt transmission, measurement of power, etc.

The study of the steam engine is made as practical as possible by the taking and studying of indicator cards, the setting of valves, the measurement of clearance, etc.

These several topics are fully discussed elsewhere under the head of Mechanical Engineering.

Physics is the basis of the study of electricity and magnetism, the phenomena of which underlie electrical engineering theory and design, and is manifestly of sufficient importance to demand considerable time and attention in the training of the electrical engineer. In addition to the work in physics prescribed for all engineering students, the electrical engineering student spends six to twelve hours per week in the Junior and Senior years in the physical laboratory and class-room.

Specialization begins in the Junior year with the advanced course in Electricity and Magnetism.
Laboratory work begins in the first term of the Junior year with a two hour (i.e. two afternoons per week) course in general physics. Laboratory work in electricity and magnetism, including work in the dynamo room and testing laboratory extends throughout the last two years of the course.

The first work in the physical laboratory embodies the accurate measurements of length, mass and time, the adjustment and use of physical instruments and the determinations of physical constants. In the laboratory course in electricity and magnetism the student makes a study of primary and secondary batteries and the electrical instruments of the laboratory, the determination of the constants of measuring instruments and the methods of measuring the several electrical quantities.

The laboratory work in Light consists largely in photometric measurements of various forms of commercial lamps.

In the laboratory work of the Senior year the more practical applications of the principles of electro-magnetism are studied, together with the principles of the magnetic circuit, of current flow, etc.

The topics of electric wiring, power transmission, electrochemistry, telegraphy, telephony and electric signalling receive attention in the latter part of the course. The laboratory work in these various topics is made to conform to the text book and lecture work.

The study of alternating currents and alternating current machinery is taken up in the Senior year. In the class room work much stress is placed upon the theory of alternating currents and in the laboratory the student is afforded opportunity to study and familiarize himself with the phenomena peculiar to such currents.

The department possesses seventeen experimental dynamos, including two arc machines, one 250 light Diamond Alternator and one 10 light Pony alternator, one 25-horse-power M. P. Ahlms-Edwards, direct-current motor; also one 45 K. W. Edison generator, and other series and shunt wound continuous-current machines. There are also transformers of various types and a secondary battery of fifty cells.

In addition to this equipment the student has access, for experimental and test purposes, to the electric machinery of the College power house and lighting plant. Among other machines in this plant are two 15 K. W. Edison dynamos; one 30 K. W. Edison dynamo; one 15 K. W. 500 volt generator; one four-pole
18 K. W. compound-wound generator; one 15 K. W. alternator; one 30 K. W. alternator, and one 60 K. W. alternator. There is also a series of motors for driving the machinery of the Mechanical Engineering Department which range in size from five to twelve horse-power, which are available for test purposes.

An extended system of wiring connects all rooms of the department with the switchboards of the dynamo laboratory and the apparatus room. At these switchboards are the terminals of a line connecting with a 110 volt, 45 K. W., direct-current machine, which is available as a current source during the day. During the evening hours there are available 110 volt direct or alternating current circuits.

The courses offered by the Department of Electrical Engineering are outlined specifically below. The course numbers are those given in the discussion of courses offered by the Department of Physics.

Course III.—Mechanics and heat, first term.

Course IV.—Light and Sound, Electricity and Magnetism, second term. Two lectures and three recitations per week. Mathematics IV, V and VI required. Course III is a prerequisite of Course IV.

In this course stress is placed upon the fundamental principles of the subject and a very thorough study is made of vector quantities and their graphical treatment in problem work.

The various subjects are discussed from a mathematical standpoint, and the student is urged to familiarize himself with the theoretical side of the work, as it is believed such a foundation is very helpful, if not absolutely essential to the work which follows. Text-book, Hastings and Beach, "General Physics." Professor Spinney, Mr. Tuttle, and Mr. Wenner.

Course VI.—Electricity and Magnetism.—Three hours per week, first term. Physics III and IV and Mathematics IX required.

Lectures, recitations and problem work. A course in the elementary theory of electricity and magnetism. Discussion of the principles of electro-magnetism. Discussion of the principles of electro-magnetic action and their application in various forms of measuring instruments and the development of laboratory methods of measuring the several electrical quantities.

COURSE X.—Dynamo Electric Machinery.—Lectures and recitations, four hours per week, second term. Physics VI is a prerequisite of this course.

General theory of the direct-current dynamo, the establishment of the electro-motive forces by induction, the magnetic circuit, armature winding, etc. A study of "characteristic curves" and the adaptation of the different types of direct-current machinery to various commercial purposes is included.

As a text and reference book S. P. Thompson's "Dynamo Electric Machinery" is used. Professor Lanphear.

COURSE XA.—Dynamo Electric Machinery.—Two hours per week, second term. Junior year, for students in Mechanical Engineering. Physics VI is a prerequisite of this course, and this course is a prerequisite of Course XXXII.

Sheldon's Dynamo Electric Machinery is used as a text book. Professor Lanphear.

COURSE XI.—Alternating Currents.—Lectures and recitations, four hours per week, first term. Physics X required.

Discussion of the theory of alternating currents, study of the circuit containing self-induction and capacity, methods of measuring currents, electro-motive force and power in alternating current circuits. Professor Spinney.

COURSE XII.—Applied Electricity.—Lectures and Problems, four hours per week, second term. Physics XI required.

Continuation of Course XI. Study of alternating current machinery—dynamos, transformers, etc., including a discussion of the synchronous motor, the induction motor, the rotary transformer and polyphase current machinery.

Discussion of high-potential transmission lines and electrical machinery adapted to transmission purposes.


COURSE XIII.—Telephony.—Lectures and recitations, one hour per week, second term. A general study of the principles of telephony, the telephone, telephone lines, cables and commercial apparatus. Open to Seniors in Electrical Engineering as an elective. Professor Lanphear.
COURSE XIV.—General Physical Laboratory.—Two afternoons per week. First term, or

COURSE XIV A.—One afternoon per week, first term.
Measurement of length, mass, and time, determination of physical constants, use of the barometer, thermometry, calorimetry, etc. Mr. Tuttle and Mr. Wenner.

COURSE XIV B.—One afternoon per week. Second term. Continuation of XIV A.

COURSE XV.—Physical Laboratory, Elementary Electrical Measurements.—One afternoon per week, second term, or

COURSE XVI.—Two afternoons per week, first term, or

COURSE XVII.—Two afternoons per week, second term. The measurement of the electro-motive force and internal resistance of primary and secondary batteries, the use of Wheatstone's bridge, measurement of current, determination of galvanometer constants, high resistance measurements, insulation tests, etc. Professor Spinney, Mr. Tuttle, and Mr. Wenner.

COURSE XVIII.—Physical Laboratory, Electrical Testing.—Two afternoons per week, first term, or

COURSE XIX.—Two afternoons per week, second term. Calibration of instruments, absolute measurements, etc. Professor Spinney, Mr. Tuttle and Mr. Wenner.

COURSE XX.—Physical Laboratory, Dynamo, Motor and Commercial Plant Testing.—Two afternoons per week, first term.
The efficiencies of dynamos and motors, experimental determination of characteristic curves, magnetic leakage, etc. Critical study of commercial plants, determination of efficiencies, etc. Professor Lanphear and Mr. Mereness.

COURSE XX A.—Physical Laboratory.—Study of alternating currents. One afternoon per week, first term. Laboratory methods for measuring inductance, capacity, etc., and,

COURSE XXI.—Physical Laboratory.—Study of alternating currents. Two afternoons per week, second term, Senior year.
Continuation of XX A. The study of alternating current dynamos and motors and commercial transformers. Professor Spinney and Mr. Mereness.

COURSE XXII.—Electric Circuits.—Two lectures per week, first term. Physics VI required.
Determination of size of leads, allowable cross-section of
conductors from the standpoint of economy, taking into consider­
ation current prices of copper, etc., the rates of interest and
the cost of electrical energy. Professor Lanphear.

COURSE XXIII.—Electric Designing.—The designs of bat­
teries, commercial ammeters, voltmeters, wattmeters, etc. One
afternoon per week, second term, Junior year.

COURSE XXIV.—Electric Designing.—Two afternoons per
week. First term, Senior Year. The design of dynamos, motors,
transformers, etc. Professor Lanphear.

COURSE XXV.—Electrical Designing.—Three afternoons per
week. Second term, Senior year. Continuation of Course XXIV.
Professor Lanphear.

COURSE XXVI.—Thesis begun, and

COURSE XXVII.—Thesis finished. Total equivalent of four
hours per week of one term.

Each student in the course of Electrical Engineering is re­
quired to prepare a thesis in the Senior year representing, in
the work done upon it, the equivalent of at least four hours
per week of one term.

This thesis may be of the nature of the design and con­
struction of some electrical machine or measuring instrument,
the efficiency test and critical study of some dynamo-electro
machine or power plant, or of electrical research work of special
direction.

COURSE XXIX.—Electrical Seminar.—One hour per week,
first term, and

COURSE XXX.—Electrical Seminar.—One hour per week, sec­
ond term. A continuation of Course XXIX. Professor Spinney.

This course consists of the preparation, presentation and
discussion of papers upon special assigned topics in electrical
engineering.

It is required that the papers presented shall be carefully
written out and submitted for critical reading to the Professor
in charge.

Journal reading is made part of this course.

COURSE XXXI.—Electric Railways and Power Transmission.
—An elementary study of the application of the principles of
electro-magnetism to the transmission and distribution of power
for industrial purposes, including power plants, transmission
lines and electric motors.

Lectures, recitations and problem work, three hours per
week, first term. Physics III, IV, and Mathematics IX required. Professor Lanphear.

Course XXXII.—Electrical Machinery.—A discussion of the construction and operation of electrical machinery and its application to electric lighting and power distribution.

Two hours per week, second term. Professor Lanphear.

ELECTRICAL ENGINEERING.

ACADEMIC YEAR.

FIRST TERM.

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SECOND TERM.

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FRESHMAN YEAR.

FIRST TERM.

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SECOND TERM.

Solid Geometry and Plane Trigonometry, 5  (Mathematics, VI.)
*French, 5 or
*German, 5
Composition, 1
History, The American Nation, 1
Descriptive Geometry, 4
Machine Sketching, 1
Shop-Work, 2
Military Drill, 2

(SOPHOMORE YEAR.

FIRST TERM.

Analytical Geometry, 5  (Mathematics, VIII.)
Physics, 5  (Physics, III.)
Chemistry, 5  (Chemistry, III.)
Shop-Work, 2  (Mechanical Engineering, XXX, XXXI, or XXXII.)
Mechanical Drawing, 2  (Mechanical Engineering, XXII.)
Composition, 1
Military Drill, 2

SECOND TERM.

Calculus, 5  (Mathematics, IX.)
Physics, 5  (Physics, IV.)
Chemistry, 5  (Chemistry, VI.)
Shop-Work, 2  (Mechanical Engineering, XXX, XXXI or XXXII.)
Mechanical Drawing, 2  (Mechanical Engineering, XXII.)
Composition, 1
Military Drill, 2

JUNIOR YEAR.

FIRST TERM.

Differential Equations, 3  (Mathematics, X.)
Analytical Mechanics, 4  (Mechanical Engineering, I.)
Electricity and Magnetism, 3  (Physics, VI.)
Physical Laboratory, 2  (Physics, XIV.)
Political Economy, 5  (Economic Science, I.)
Engineering Laboratory, 1.  (Mechanical Engineering, XII.)
Shop-Work, 2  (Mechanical Engineering, XXXIII.)
*Debating, 1

*Elective, subject to the approval of the Professor of Electrical Engineering.
**History, XIXth Century, 2**

SECOND TERM.

Analytical Mechanics, 4
Dynamo-Electric Machinery, 4
Steam Engine, 3
Materials of Construction, 3
Electrical Design, 1
Physical Laboratory, 2
Engineering Laboratory, 1
Shop-Work, 2
*Debating, 1
**History, XIXth Century, 2

(SEcond Engineering, II.)
(Mechanical Engineering, IV.)
(Mechanical Engineering, III.)
(Electrical Engineering, XXIII.)
(Physics, XVII.)
(Mechanical Engineering, XIII.)
(Mechanical Engineering, XXXIV.)
(English, VIII.)
(History, VIII.)

SENIOR YEAR.

FIRST TERM.

Alternating Currents, 4
Hydraulics, 4
Steam Engine Design, 3
Physical Laboratory, 3
Electrical Design, 2
Electric Circuits, 2
**History, XIXth Century, 2
Seminar, 1
Thesis, 1

(Physics, XI.)
(Mechanical Engineering, VI.)
(Mechanical Engineering, VII.)
(Physics, XX.)
(Electrical Engineering, XXIV.)
(Electrical Engineering, XXII.)
(History, VII.)
(Electrical Engineering, XXIX.)
(Electrical Engineering, XXVI.)

SECOND TERM.

Constructive Engineering, 3
Physical Laboratory, 2
Electrical Design, 3
Applied Electricity, 4
*Telephony, 1
**History, XIXth Century, 2
Seminar, 1
Thesis, 3

(Mechanical Engineering, IX.)
(Physics, XXI.)
(Electrical Engineering, XXV.)
(Physics, XII.)
(Electrical Engineering, XIII.)
(History, VIII.)
(Electrical Engineering, XXX.)
(Electrical Engineering, XXVII.)

*Elective.

**Elective in either term of Junior or Senior year, subject to the approval of Professor of Electrical Engineering.
The courses in Mining Engineering are planned to give the student a ready familiarity with the branches which form the groundwork of the science of Mining and Metallurgy. The Department of Mining Engineering aims to give him such a thorough training in the fundamentals as will enable him after graduation to acquire in a comparatively short time the practical experience absolutely necessary before he is fitted to assume positions of great responsibility in the mining industries. The Department offers two courses: a four years; and a two years. The first is intended for those students who desire a "thorough course in Theoretical and Practical Mining," and underlying sciences, and leads to the degree of Bachelor of Science in Mining Engineering. The requirements for admission are the same as those for admission to other Engineering courses. Students who pursue this course to completion are expected to be able to undertake the "full management of mining in its various branches," at least as practiced in Iowa and to become familiar with the principles involved and the methods employed in good mining engineering practice in general.

The latter course is designed for young men who have had some practical experience in mines, and wish to study mine surveying, drafting, the problems of ventilation, drainage, haulage, mine operating, etc., and also to learn something of the sciences which bear upon their work but have neither the time nor the preparation for a full College course. Elementary mathematics, drawing and shop-work receive considerable attention during the first year, while the professional studies are reserved for the second year. Candidates who are twenty-one years of age or over are admitted without examination. All others must give evidence of a thorough grounding in the common branches.

EQUIPMENT.

The Department of Mining Engineering occupies six rooms on the third floor and one on the first floor of Engineering Hall and shares in common with the other Engineering departments the blue print, photographic, Engineering Museum and Assembly
rooms. Of the rooms used exclusively by the Department of Mining Engineering, one is used for laboratory purposes only, two for laboratory and lecture purposes, one as a museum, and three afford space for supplies, instruments, books, and filing cases, in addition to their use for office purposes.

Lecture Room and Laboratory in Mining Engineering.—This room is provided with seventy-five opera chairs with folding arm rests, a wall table cabinet occupying all of the outside wall space and so arranged as to provide excellent working space in front of the windows while the space between the windows is utilized for the filing of study material. Above the wall table, lockers with glass doors are provided, in which students may keep books and small pieces of apparatus free from dust. The windows are all provided with opaque shades and the room with a permanent lantern screen. The balance of the interior wall space is occupied by slate blackboards. A large cabinet lecture table completes the equipment of the room.

Seminar Room.—The seminar room is used for both laboratory and lecture purposes as in the case of the preceding, in addition to serving as a conference room and headquarters for the Junior and Senior students in Mining Engineering. It is equipped with two long tables standing at right angles to and directly connected with a large cabinet lecture table, the whole forming a continuous table in the form of a U. The room has a seating capacity of thirty-six and is supplied with movable revolving chairs, and slate blackboards on the interior walls. In addition the room contains a twenty-two tray filing case for large drawings, plats and maps, and a supply case.

Metallurgical Laboratory.—The laboratory for Metallurgy and Ceramics is located on the ground floor and is fitted with soapstone topped cabinet wall tables occupying all the outside walls and a large fume chamber, supply and display cases. It is supplied with water, gas, compressed air, exhaust and electrical connections. It already contains a Hoskin's No. 4 muffle furnace and a Bosworth assay furnace with the usual accessories for doing metallurgical and ceramic work.

The Museum.—The museum for Geology and Mining Engineering is fitted with eight museum cases with sloping glass tops and cabinet bases. The bases supply room for one hundred and ninety-two trays in which the working collections and duplicate material in Geology and Mineralogy are filed. One large cen-
tral case containing the larger casts of the "Ward Series," a series of cases, showcase tops and cabinet bases, occupy the space between the windows, and permanent cases occupy all of the partition wall space.

The offices supply room for apparatus, supplies, books, and filing cases.

The Department is supplied with a Sullivan core drill with a complete set of tools and accessories for carrying on actual field operations, a "Queen" Light Mountain mining transit; two "Berger." No. 4 Mining transits with interchangeable side and top telescopes; a Brunton transit; a sensitive six-dial anemometer reading to ten millions of feet and adapted for the measurement of currents of air through mines and tunnels—an instrument absolutely necessary in order to deal intelligently with the problems of mine ventilation; rods and sighting poles; a set of miner's tools; a barometer, clinometer, a series of miner's lamps and various instruments used in ascertaining distances.

During the past year the department has received through the generosity of the J. George Leyner Engineering Works of Denver, Colorado, one Water Leyner Rock Drill, with column, condenser, and full complement of steel.

The laboratory in Metallurgy and Ceramics, aside from the list of utensils to be found in any well equipped laboratory for that branch of chemical work, is supplied with the following special pieces of apparatus: Weatherhead mortar and porcelain mortars for pulverizing; a set of brass brickette molds; chemical balance; torsion balance; one Hoskin's No. 4 muffle furnace; one Bosworth assay furnace; Le Chatelier thermo-electric pyrometer; and a Seger volumeter.

The proximity of Ames to the Iowa coal fields affords easy access to the coal mines of Boone and Polk counties. The great centers of the clay industries, Des Moines, Boone, and Fort Dodge are equally accessible, while the quarries of Marshall county are scarcely more than an hour's ride from the College. These and numerous allied industries are, after all, the most important and indispensable laboratories for the practical mining engineer. The Department undertakes to present the accepted theories concerning mineral aggregation, origin and occurrence but these theories can be put to the test only by an intelligent use of the drill, the level and the plane table. The accredited methods of winning the ores and minerals receive full discussion
in the class-room, but only render obvious the necessity of becoming familiar with the practical workings of the sluice box, the tipple and the stamp mill. The chemical and physical properties of a clay may be ascertained in the laboratory, but a complete knowledge of its properties and its mode of treatment can be gained only by following it from the pit to the street. In short, the Department aims to give as complete an exposition of the theories and laws which underlie the Science of Mining as the time will permit, but the verification and application of these theories and laws must be made, in large measure, in the field and in the industries.

It is the settled policy of the department to carry on such investigation work as may be of benefit to the mining and manufacturing interests of the state. In cooperation with the other Engineering departments considerable work has been done and is being done on fuels, clays and structural materials. The department is also prepared to do a limited amount of assaying, test clays and fuels, do mine surveying, prepare mine maps and plats, examine and report on mine and clay properties for citizens of the state at reasonable cost. In fact the atmosphere produced by practical investigation work is believed to be necessary to the healthful growth of the engineer, and no opportunity is lost to encourage work along these lines.

COURSES IN MINING.

The work of the first two years in the four years' course in Mining Engineering is exactly the same as that required in the course in Mechanical Engineering, with the exception that Surveying takes the place of Mechanical Drawing, and the addition of Principles of Mining in the second term, Freshman. The professional studies are given due prominence during the last two years of the course and the student is required to take continuous work in mining, chemistry and metallurgy and geology, through the last three terms. He is expected to make one of these branches the subject of special investigation and to embody the results of such investigation in a thesis, which is required of every student who is a candidate for graduation.

It is generally recognized that there is of necessity a considerable gap between the work included in the College curriculum and that of the professional engineer; and that the student in Engineering must gain the larger part of his professional training outside of college walls. The courses in summer field
work are offered in the hope that his apprenticeship may be reduced to a minimum, and are required of all students in the four years' course in Mining Engineering.

Course I.—Principles of Mining.—Two hours per week, second term, Freshman year. The student receives instruction in the general and elementary principles of mining in order that he may appreciate something of what he sees and hears before he makes a detailed study of Prospecting, Exploitation, Mining Methods and the various subjects included in Courses II, III and IV. Special attention is given to mining terms and local mining methods.

Course II.—The Principles of Mining.—Second term. Junior year, and counts three hours per week. The first ten weeks of the term are devoted to a consideration of the methods employed in excavating, boring and shaft-sinking, and in mining and the support of mine excavations, while the remainder of the term is given up to a critical study of methods employed in exploration, development and mine working in general.

Course III.—Continuation of Course II.—Three hours per week and runs through the first term, Senior year. The work embraces a thorough discussion of the principles involved in coal mining in general and is followed by a careful consideration of those principles which are applicable to the Iowa coal fields in particular. Mine ventilation, drainage and lighting receive due attention.

Course IV.—Mining Engineering.—Second term, Senior year, and counts four hours per week. Mine plant, administration and mine accounts receive especial attention. The term's work involves a critical study of mining machinery, with especial reference to the types best adapted to meet the requirements of the various conditions in actual practice. Also mine buildings and the general equipment and administration of a mine plant are considered. About one-half of the term will be devoted to ore-dressing.

Course V.—Mining Law.—One hour per week, second term of Senior year. An outline of the most important laws affecting the mineral industry is presented to the men as they are completing their work in the department. While the laws on the statute books at the present time are for the greater part local and while a study of them in the time available is out of the question, the necessity of some knowledge of the law is im-
pressed upon the student and he is shown where he can obtain information on the simpler questions.

**Course VI.**—*Seminar.*—Required of the students in Mining Engineering, first term, Junior year, and counts one hour.

**Course VII.**—*Seminar.*—Continues the work of Course VI. Counts one hour second term, Junior year.

**Course VIII.**—*Seminar.*—A continuation of Course VII and counts one hour, first term, Senior year.

**Course IX.**—*Seminar.*—Continues the work of the three terms preceding and counts one hour, second term, Senior year. Courses VI to IX, inclusive, are for the purpose of bringing together the students of the Junior and Senior years and members of the instructing corps for weekly conferences. Such conferences afford occasion for the discussion of timely topics in which the student members take part freely.

**Course X.**—*Mine Surveying.*—Two hours per week first term, Junior. During the Sophomore year the mining student takes the regular course in surveying offered by the department of Civil Engineering. Mine Surveying supplements the work of the Sophomore year and presents various methods of surveying specially adapted to mines and tunnels. Part of the time is given to practical work with top and side telescope and the various calculations which its use requires.

**Course XI.**—*Thesis.*—Required of all candidates for graduation in the course of Mining Engineering and counts one hour during the first term, Senior year, and three hours during the second term.

**Course XII.**—*Summer Field Work in Mine Surveying.*—The work is carried on in one of the coal mining districts of the state and comprises the complete survey of a mine and a thorough examination of the equipment and mode of operation of a typical mine for the district, and leads in the first place to a mine map, and in the second to a careful report on a mine property, accompanied by the necessary illustrations. The time required is two full weeks. Open to students who have completed the Freshman or Sophomore years.

**Course XIII.**—*Summer Field Work in the Study of Mine Operation and Equipment, and of Concentrating Plants.*—This course necessitates a visit to one of the great metal producing centers outside of the state. A careful study of mine properties is made, and a detailed report, properly illustrated by sketches and
drawings, is required. A portion of the time is devoted to a study of ore dressing and concentrating plants. The time required is four weeks, and the course is open to students who have completed the Junior or Senior years.

**Course XIV.—Metallurgy.**—Three hours per week, second term, Junior year. The term's work comprises a study of refractory materials, fluxes, fuels and furnaces and the metallurgy of iron and steel. Especial attention is given to pyrometry, calorimetry, fire clays and coke. The various metallurgical furnaces are studied from working drawings. At the close of the term a few weeks are devoted to the science of metallography.

**Course XV.—Metallurgy Continued.**—Five hours per week first term, Senior year. Instruction in this course is confined to the processes relating to copper, lead, silver, gold and zinc. In the time allotted to the work, a study of the metallurgy of all the metals could not be made satisfactorily, and it is deemed best to confine the work to the most important metals and the most important processes. The principles of ore dressing and preparation for metallurgical treatment is given in the second term, Senior year, in Course IV.

**Course XVI.—Ceramics.**—The work of the term is devoted to a consideration of the origin, composition, properties and distribution of the crude materials used in the clay and cement industries. The physical properties of clays are studied and mechanical analyses are made in the laboratory, paralleling the class-room work.

**Course XVII.—Ceramics.**—The course includes a discussion of the principles involved in the manufacture of clay goods. Methods of selecting and winning the raw materials, their preparation, standard processes of manufacture, burning and clay testing are treated as fully as the time will permit.

**Course XVIII.—Ventilation and Haulage.**—Five hours per week, first term, second year in the two years' course in Mining. The work of the term is devoted to a careful consideration of the problems affecting the distribution of air in mines and mine drainage. Some attention is given to the discussion of standard methods of hoisting and haulage in mines.

**Course XIX.—Mine Exploration and Operation.**—Five hours per week during the last term in the two years' course in Mining. Exploration, shafting, timbering, and methods of mine operation, especially as adapted to the Iowa coal fields are the prin-
principal topics treated. Mine accounts and administration receive such attention as their importance and the time will permit.

**COURSE XX.** — *Mining Arithmetic.* — Five hours per week first term of first year in the two years' course in Mining. The fundamental operations in arithmetic are reviewed rapidly during the first half of the term, while measurements, square and cube root and practical problems relating to mining are made duly prominent during the last half of the term.

**COURSE XXI.** — *Field Work in Mine Surveying.* — First term, first year in the two years' course in Mining Engineering. The first year men serve as apprentices in the work of mine surveying, acting in the capacity of rod-men and chainmen to the parties conducted by higher classmen.

**COURSE XXII.** — *A Continuation of Course XXI.* — During the first half of the term on account of the usual inclemency of the weather, one half day per week is devoted to a study of mine plats and maps.

**COURSE XXIII.** — *Field Work in Mining.* — First term, second year, and required of students in the two years' course in Mining.

**COURSE XXIV.** — *Continues the Work of Course XXIII.* — Special attention is directed to mine operation and equipment.

**COURSES IN GEOLOGY REQUIRED OF STUDENTS IN VARIOUS ENGINEERING COURSES.**

**COURSE I.** — *Physiography.* — First term, Freshman, three hours per week; serves as an introduction to the science of Geology. The first half of the term is devoted to the study of the agents which have to do with modifying the earth's crust, while the resultant earth features receive careful consideration during the second half of the term. Davis' or Tarr's Elements of Physical Geography is the text-book used. Required in the Division of Science, in the courses in Agronomy and Horticulture of the Division of Agriculture and the two years courses in Mining Engineering and Clay Working.

**COURSE II.** — *General Geology.* — Five hours per week first half of Junior Year. This course embraces a discussion of the principles which form the groundwork of the science. The first ten weeks are devoted to dynamic and structural geology and the last six weeks to stratigraphic and historical geology. The student is required to make several excursions to points of geological in-
terest to verify the more salient facts discussed in the class-room. Prerequisites: Physics III and IV and Chemistry III and IV.

COURSE III.—Engineering Geology.—The term is devoted to a discussion of the fundamental principles of dynamical and structural geology, and a study of the common minerals and rocks, especially those important in structural materials. The course is given in the second semester and counts four hours per week. Prerequisites the same as for Course II.

COURSE IV.—Geology, Advanced.—Five hours per week second term of Senior year. The nature, mode of occurrence and origin of the minerals and rocks which constitute the earth's crust, are considered in some detail in the first half of the term, while rock alteration as involved in metamorphism and weathering receives special attention during the second half. Excursions are continued as in Course II, and students are encouraged to familiarize themselves with the methods employed in doing research work and to make independent observations. Prerequisite: Geology II or III.

COURSE VI.—Mineralogy.—Two hours class-room and one hour laboratory per week, second half of Junior year. This course is intended to give the student a clear idea of the morphological and physical properties of crystalline substances. Prerequisites: Physics III and IV, Chemistry III and IV and Mathematics VI.

COURSE VII.—Mineralogy, Descriptive and Determinative.—Two hours class-room work and one hour laboratory per week, first term of Senior year. This work is devoted to the study of the more important mineral species, their properties, uses, distribution and methods of determination. Prerequisites, Geology VI.

**MINING ENGINEERING.**

**ACADEMIC YEAR.**

**FIRST TERM.**

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**SECOND TERM.**

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<td>Algebra</td>
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<td>Plane Geometry</td>
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Elementary Rhetoric, 5  
French, 3, or  
German, 3  
History, 2  
Drawing, 2  

(English, II.)  
Languages, XI.)  
Languages, XIII.)  
History, XVI.)  
(Mechanical Engineering, XX.)

**FRESHMAN YEAR.**

**FIRST TERM.**

Advanced Algebra, 5  
*French, 5 or  
*German, 5  
Advanced Rhetoric, 5  
History, Formative Periods, 1  
Shop-Work, 2  
Mechanical Drawing, 2  
Lettering, 1  
Military Drill, 2  

(Mathematics, IV.)  
Languages, III.)  
Languages, VII.)  
(English, III.)  
(History, XVII.)  
(Mechanical Engineering, XXIX.)  
(Mechanical Engineering, XXI.)  
(Civil Engineering, I.)  
(Military, I.)

**SECOND TERM.**

Solid Geometry and Plane Trigonometry  
*French, 5, or  
*German, 5  
Composition, 4  
Descriptive Geometry, 4  
Machine Sketching, 1  
Shop-Work, 2  
Military Drill, 2  
Principles of Mining, 2  
*Summer Field Work, Two Weeks.

(Mathematics, VI.)  
Languages, IV.)  
Languages, VIII.)  
(English, IV.)  
(Civil Engineering, IV.)  
(Mechanical Engineering, XX.)  
(Mechanical Engineering, XXX.)  
(Military, II.)  
(Mining Engineering, I.)

**SOPHOMORE YEAR.**

**FIRST TERM.**

Analytical Geometry, 5  
Surveying, 4  
Physics, 5  
Chemistry, 5  

(Mathematics, VIII.)  
(Civil Engineering, VIII.)  
(Physics, III.)  
(Chemistry, III.)

*Beginning with September, 1904, the French or German in the Freshman year will be second year work.

Students entering the Freshman year, September, 1903, with credits for first year French or German will be required to take second year work in the same language. Students entering the Freshman year, September, 1903, without previous work in French or German will be required to take first year work only.

**Students who secure instructive employment during their summer vacations between Freshman-Sophomore and Sophomore-Junior years will be excused from summer field work providing they are so employed for at least one month subject to the approval of the head of the department.
Drawing, 2  (Mechanical Engineering, XXII.)
Composition, 1  (English, V.)
Military Drill, 2  (Military, III.)

SECOND TERM.

Calculus, 5  (Mathematics, IX.)
Surveying, 4  (Civil Engineering, IX.)
Physics, 5  (Physics, IV.)
Chemistry, 5  (Chemistry, VI.)
Composition, 1  (English, VI.)
Drawing, 2  (Mechanical Engineering, XXIII.)
Military Drill, 2  (Military, IV.)

*Summer Field Work, Two Weeks.

JUNIOR YEAR.

FIRST TERM.

Analytical Mechanics, 4  (Mechanical Engineering, I.)
Electric Railways and Power Transmission, 3  (Electrical Engineering, XXXI.)
Geology, 5  (Geology, II.)
Chemistry, 5  (Chemistry, VII and VIII.)
Mine Surveying, 2  (Mining Engineering, X.)
****History, XIX Century, 2  (History, VII.)
Seminar, 1  (Mining Engineering, VI.)
**Debating, 1  (English, VII.)

SECOND TERM.

Analytical Mechanics, 4  (Mechanical Engineering, II.)
Steam Engine, 3  (Mechanical Engineering, IV.)
Mineralogy, 3  (Geology, VI.)
Mining, 3  (Mining Engineering, II.)
Chemistry, 3  (Chemistry, XII.)
Metallurgy, 3  (Mining Engineering, XIV.)
****History, XIX Century, 2  (History, VIII.)
Seminar, 1  (Mining Engineering, VII.)
**Debating, 1  (English, VIII.)

***Summer Field Work, Four Weeks.

*Students who secure instructive employment during their summer vacations between Freshman-Sophomore and Sophomore-Junior years will be excused from summer field work providing they are so employed for at least one month subject to the approval of the head of the department.

**Elective, subject to the approval of the Professor of Mining Engineering.

***Junior students in Mining Engineering who secure instructive employment in one of the great metal mining districts of the country will be excused from the Junior summer field work providing they are so employed for at least six weeks, subject to the approval of the head of the department.

****Elective in either term of Junior or Senior year, subject to the approval of the head of the mining Engineering Department.
DIVISION OF ENGINEERING

SENIOR YEAR.

Railway Engineering, 5
Mineralogy, 3
Metallurgy, 5
Mining, 3
Chemistry, 2
Engineering Laboratory, 1
Specifications and Contracts, 1
*History, XIX Century, 2
Seminar, 1

(Civil Engineering, X.)
(Geology, VII.)
(Mining Engineering, XV.)
(Mining Engineering, III.)
(Chemistry, XXX.)
(Mechanical Engineering, XII.)
(Mechanical Engineering, VIII.)
(History, VII.)
(Mining Engineering, VIII.)

SECOND TERM.

Materials of Construction, 3, or
Political Economy, 3, or
Constructing Engineering, 3
Geology, 5
Mining, 4
Engineering Laboratory, 1
Mining Law, 1
*History, XIX Century, 2
Seminar, 1
Thesis, 3

(Mechanical Engineering, III.)
(Economic Science.)
(Mechanical Engineering, IX.)
(Geology, IV.)
(Mining Engineering, IV.)
(Mechanical Engineering, XIII.)
(Mining Engineering, V.)
(History, VIII.)
(Mining Engineering, IX.)
(Mining Engineering, XI.)

TWO YEARS COURSE IN MINING ENGINEERING.

FIRST YEAR.

FIRST TERM.

Mining Arithmetic, 5
Elementary Algebra, 5
Elementary Physics, 5
Drawing, 2
Shop-Work, 2
Field Work in Mine Surveying, One-Half Day per Week

(Mining Engineering, XX.)
(Mathematics, I.)
(Physics, V.)
(Mechanical Engineering, XXI.)
(Mechanical Engineering, XXIX.)
(Mining Engineering, XXI.)

SECOND TERM.

Geometry, 5
Advanced Algebra, 5
Plane Trigonometry, 5
Physical Geography, 3
Drawing 2

(Mathematics, II.)
(Mathematics, VIB.)
(Geology, I.)
(Mechanical Engineering, XX.)

*Elective in either term of Junior or Senior year, subject to the approval of the head of the mining Engineering Department.
Shop-Work, 2  
Field Work in Mine Surveying, One-Half Day per Week  

(SECOND YEAR.)

FIRST TERM.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
<th>Department (Year)</th>
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<tbody>
<tr>
<td>Mining</td>
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<td>(Mining Engineering, V.)</td>
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<tr>
<td>Mine Surveying</td>
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<td>(Mining Engineering, X.)</td>
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<tr>
<td>Engineering Geology</td>
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<td>(Geology, III.)</td>
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<tr>
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<tr>
<td>Mechanical Drawing</td>
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<td>(Mechanical Engineering, XXII.)</td>
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<td>Engineering Laboratory</td>
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SECOND TERM.

<table>
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<tbody>
<tr>
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<td>Steam Engineering</td>
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<td>Economic Geology</td>
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<td>(Geology, IV.)</td>
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<td>Chemistry</td>
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<td>(Chemistry, VI.)</td>
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<tr>
<td>Field Work in Mining Engineering</td>
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<td>(Mining Engineering, XIV.)</td>
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</table>

**COURSE IN CLAY-WORKING AND CERAMICS.**

The short course in Clay-Working is designed to assist young men to a knowledge of the fundamental principles which underlie the science of Ceramics. The course is offered with a view of extending the same sort of service to the Ceramic industries as the course in Agriculture renders to the Agricultural industries, or the course in Mechanical Engineering renders to the Mechanical industries.

**TWO YEARS COURSE IN CERAMICS.**

**FIRST YEAR.**

**FIRST TERM.**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
<th>Department (Year)</th>
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<tr>
<td>Elementary Mineral Chemistry</td>
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<tr>
<td>Elementary Physics</td>
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<td>(Physics, V.)</td>
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<tr>
<td>Drawing</td>
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<td>(Mechanical Engineering, XXI.)</td>
</tr>
<tr>
<td>Shop-Work</td>
<td>2</td>
<td>(Mechanical Engineering, XXIX.)</td>
</tr>
</tbody>
</table>
SECOND TERM.

Mineral and Geological Chemistry, 5
Plane and Solid Geometry, 5
Physical Geography, 3
Drawing, 2
Shop-Work, 2

(Agricultural Chemistry, XIV.)
(Mathematics, V.)
(Geology, I.)
(Mechanical Engineering, XX.)
(Mechanical Engineering, XXX.)

SECOND YEAR.

FIRST TERM.

Chemistry of Clays, 5
Ceramics, 5
Engineering Geology, 4
Mechanical Drawing, 2

(Agricultural Chemistry, XV.)
(Mining Engineering, XVII.)
(Geology, III.)
(Mechanical Engineering, XXII.)

SECOND TERM.

Chemistry of Clays and Glazes, 5
Ceramics, 5
Steam Engineering, 2
Economic Geology, 5
Testing Clay Products, 3

(Agricultural Chemistry, XVI.)
(Mining Engineering, XVI.)
(Mechanical Engineering, XVIII.)
(Geology, IV.)
(Civil Engineering.)
DIVISION OF SCIENCE AS RELATED TO INDUSTRIES

MATHEMATICS.
PHYSICS.
CHEMISTRY.
BOTANY.
ZOOLOGY.
GEOLOGY.
ECONOMIC SCIENCE.
DOMESTIC SCIENCE.
PSYCHOLOGY.
LITERATURE AND RHETORIC.
PUBLIC SPEAKING.
MODERN LANGUAGES.
HISTORY.
CIVICS.
MILITARY SCIENCE.
LIBRARY.
MUSIC.
FACULTY

ALBERT BOYNTON STORMS, A. M., D. D.,
President, Dean of Science and General and Domestic Science.

EDGAR WILLIAM STANTON, M. Sc.,
Dean of the Junior College and Professor Mathematics and Economic Science.

M. STALKER, M. Sc., V. S.,
Lecturer on Veterinary Medicine.

GEN. JAMES RUSH LINCOLN,
Professor of Military Science.

ALFRED ALLEN BENNETT, M. Sc.,
Professor of Chemistry.

LOUIS HERMANN PAMMEL, B. Ag., M. S., Ph. D.,
Professor of Botany.

GEORGE WELTON BISSELL, M. E.,
Professor of Mechanical Engineering

ANSON MARSTON, C. E.,
Dean of the School of Engineering and Professor of Civil Engineering.

MISS LIZZIE MAY ALLIS, B. A., M. A.,
Professor of French and German.

LOUIS BEVIER SPINNEY, B. M. E., M. Sc.,
Professor of Physics and Electrical Engineering.

SAMUEL WALKER BEYER, B. Sc., Ph. D.,
Professor of Geology and Mining Engineering.

ALVIN B. NOBLE, B. Ph.,
Professor of Rhetoric and English Literature.

HENRY E. SUMMERS, B. Sc.,
Professor of Zoology.

ADRIAN M. NEWENS, B. O.,
Professor of Public Speaking.

ORANGE HOWARD CESSNA, A. M., D. D.,
Professor of History and Psychology.

JOHN H. MCNEALL, V. M. D.,
Dean of Veterinary Science.
CARL WARREN GAY, D. V. M.,
Professor of Pathology and Histology.

M. JACOB, V. M. D.,
Professor of Veterinary Medicine and Sanitary Science.

ARTHUR THOMAS ERWIN, M. S. A.,
Professor of Horticulture.

*MISS GEORGETTA WITTER, B. L.,
Professor of Domestic Science.

*RICHARD C. BARRETT, A. M.,
Professor of Civics

BURTON SMITH LANPHEAR, M. M. E.,
Assistant Professor of Electrical Engineering.

LEWIS EUGENE ASHBAUGH, B. S., Ph. B.,
Assistant Professor of Civil Engineering.

**MISS ELMINA T. WILSON, C. E.,
Assistant Professor of Civil Engineering.

MISS MARIA M. ROBERTS, B. L.,
Assistant Professor of Mathematics.

HERBERT WILLIAM DOW, B. S. IN M. E.,
Assistant Professor of Mechanical Engineering.

WALTER A. STUHR, D. V. M.,
Assistant Professor of Physiology and Therapeutics.

MISS LOLA ANN PLACEWAY, B. Sc.,
Assistant Professor of Chemistry.

MISS BESSIE B. LARRABEE, A. B.,
Assistant Professor of English.

MISS ELIZABETH MACLEAN, M. Di.,
Assistant Professor of English.

EDWARD EVERETT BUGBEE, E. M.,
Assistant Professor of Mining Engineering.

FRANK FRENCH,
Acting Assistant Professor of Civil Engineering.

FRANK JORDAN RESLER, B. Ph.,
Director of Music, Vocalist.

MRS. MARY ELIZABETH RESLER, B. Ph.,
Instructor in Instrumental Music.

*To take charge of Department September 1st, 1904.
**Granted one year's leave of absence.
MRS. MARIAN H. KILBOURNE, B. L.,
Dean of Women.

**IRA ABRAHAM WILSON, B. Sc.,
Instructor in Geology and Mining Engineering.

ERNEST ALANSON PATTEngILL, B. S.,
Instructor in Mathematics.

ELBERT BARRETT TUTTLE, B. S. in E. E.,
Instructor in Physics.

MISS JULIA COLPITTS, M. A.,
Instructor in Mathematics.

MISS HELEN GERTRUDE REED, Ph. B.,
Instructor in English.

MISS GRACE ISABEL NORTON, B. A.,
Instructor in German

**MISS ADA J. MILLER, Ph. B.,
Instructor in English

JOSEPH E. GUTHRIE, M. Sc.,
Instructor in Zoology.

MISS SARAH CAROLINE HOOK, B. L.,
Instructor in Public Speaking and Physical Culture for Women.

CHESTER MURRAY PERRIN, B. Sc.,
Instructor in History

BENJAMIN H. HIBBARD, B. Ag., Ph. D.,
Instructor in Economic Science.

FRANK WENNER, B. S.,
Instructor in Physics

MISS BERYL A. HOYT, A. B.,
Instructor in English

MISS FRANCES MARIETTA WILLIAMS, B. Sc.,
Instructor in Domestic Art.

MRS. ALICE MERRITT PARKS, B. Sc.,
Instructor in Domestic Science in charge of Department.

MISS ANNIE W. FLEMING, B. Sc.,
Instructor in Mathematics

MISS MAE MILLER, B. Sc.,
Instructor in History.

**Granted one year's leave of absence.
JOHN EDGAR STEWART, B. C. E.,
Instructor in Civil Engineering.

MISS FANNIE ORA EDGETT, B. Sc.,
Instructor in Civil Engineering.

WARD MURRAY JONES, B. C. E.,
Instructor in Mathematics.

H. R. WATKINS,
Instructor in Chemistry.

CLARENCE ROY MCKENNEY, B. Sc.,
Instructor in Chemistry.

HENRY MARTIN PARKS, B. Sc. in Min. Eng.,
Instructor in Mining Engineering.

JOHN STARR COYE, B. Sc.,
Instructor in Chemistry.

MISS HARRIETT KELLOGG,
Instructor in Botany.

MISS FLORENCE' ANN LUCAS,
Instructor in French.

MISS EFFIE ALENE WHITE, A. B.,
Instructor in English

MISS ROSE ABEL, A. B.,
Instructor in English

MISS RUTH MORRISON, A. B.,
Instructor in Domestic Economy.

JOHN F. TRAVIS, A. M.,
Instructor in Mathematics

EDWARD ELIAS LITTLE, M. S. A.,
Assistant in Horticulture.

MISS VINA ELETHE CLARK,
Librarian

MISS OLIVE STEVENS, B. L.,
Assistant Librarian
DIVISION OF SCIENCE AS RELATED TO THE INDUSTRIES

Many of the courses of study taught in this Division form a
to be the beginning of an important
very thoroughly interwoven.

The object of the work in this Division is very comprehen-
sively expressed in the act of Congress establishing this and
similar colleges. The founding of these colleges on a basis of
scientific learning has proved to be the beginning of an important
epoch in educational history. The courses of study in this
Division are less technical than are many of those of the other
Divisions. The real advances in modern civilization have been
along the lines of science study and investigations. It is the
intent therefore to lay a broad foundation in scientific facts and
principles in order to fit the graduate to fill his place in the affairs
of the world. There can be no better preparation for the duties
of life and for citizenship than the knowledge and mental train-
ing given by a genuine study of the sciences.

During the first two years the lines of study are well marked
out and but little choice of subjects is given. The required
mathematics end with the Freshman year. The subject may be
pursued, however, during the remainder of the course, provided
the student desires and is qualified to do so.

The various branches of the study of the English language
extending throughout the Freshman and Sophomore years are
sufficient in scope and purpose to give the needed training in the
use of English. The modern languages, namely, French and
German, are great store-houses of the sciences, and consequently
courses of study in these languages are offered to the student in
the earlier years of his work to enable him to use these languages
in the last two years of his study.

Students in this course are required to select at the begin-
ning of the Junior Year a particular science which shall consti-
tute a line of work during the last two years of the course. They
must devote at least three hours per week to this science each
term and not less than thirty-two hours of scientific work must
be taken in the two years. The other studies may be taken from
the electives offered. The study of the sciences is strongly sup-
ported by work in literary, historical and psychological lines.

The course in Science leads to the degree of Bachelor of
Science (B. S.).
The course in General and Domestic Science leads to the degree of Bachelor of Science (B. S.).

The course in Domestic Science leads to the degree of Bachelor of Domestic Science (B. D. S.).

SCIENCE.

(For Men and Women).

ACADEMIC YEAR.

FIRST TERM.

Algebra, 5 (Mathematics, I.)
English, 5, or (English, I.)
*German, 5 (Languages, V.)
Elocution, 2 (Elocution, I.)
Drawing, 2 (Mechanical Engineering, XIX.)
History, Ancient History to Charlemagne, 5 (History, I.)

SECOND TERM.

Algebra, 5 (Mathematics, II or III.)
Plane Geometry, 5 (Mathematics, V.)
Elementary Botany, 2 (Botany, I.)
Elementary Rhetoric, 5 or (English, II.)
German, 5 (Languages VI.)
History, History of Western Europe, 4 (History, II.)

FRESHMAN YEAR.

FIRST TERM.

Advanced Algebra, 5 (Mathematics, IV.)
Botany, Ecology, 2 (Botany, II.)
**German, 5 or (Languages, V or VI.)
French, 5 (Languages, I.)
Physiography, 3 (Geology, I.)
Advanced Rhetoric, 5 (English, III.)
**Domestic Art, 2 (for women) (Domestic Economy, I.)
Military Drill, 2 (for men) (Military, I.)
Library Work, 4 hours (Library, I.)
Physical Culture, 1 (for women).

*Beginning German may be taken only by those students who can show satisfactory evidence of proficiency in the English of the Academic year.
**Elective.
SECOND TERM.

Solid Geometry and Plane Trigonometry, 5 (Mathematics, VI.)
**German 5, or (Languages, VI or VIII.)
French, 5 (Languages, II.)
Histology, 4 (Botany, III.)
Entomology, 2 (Zoology, I.)
Elocution, 1 (Elocution, II.)
Composition, 1 (English, IV.)
*Domestic Science, 2 (for women) (Domestic Economy, II.)
Military Drill, 2 (for men) (Military, II.)
Physical Culture, 1 (for women).

SOPHOMORE YEAR.

FIRST TERM.

**Analytical Geometry, 5 (Mathematics, VIII.)
**Cryptogamic Botany, 5 (Botany, IV.)
**Vertebrate Zoology, 5 (Zoology, II.)
German, 4, or (Languages, IX.)
French, 4 (Languages, III.)
Physics, 5 (Physics, III.)
Composition, 1 (English, V.)
*Domestic Science, 2 (for women) (Domestic Economy, III.)
Military Science, 2 (for men) (Military, III.)
Physical Culture, 1 (for women).

SECOND TERM.

***Calculus, 5 or (Mathematics, IX.)
***Invertebrate Zoology, 5 (Zoology, III.)
Chemistry, 5 (Chemistry, II.)
Physics, 5 (Physics, IV.)
Composition, 1 (English, VI.)
*Domestic Art, 2 (for women) (Domestic Economy, IV.)
Military Drill, 2 (for men) (Military, IV.)
Physical Culture, 1 (for women).

*Elective.
**The student shall elect two of these studies. The study omitted may be elected in the Junior or Senior year and counted in those years.
***Choice between Calculus and Invertebrate Zoology. The study omitted may be taken in the Junior or Senior year and counted in those years.
*JUNIOR YEAR.

FIRST TERM.

Analytic Geometry, 5  (Mathematics, VIII.)
Differential Equations, 3  (Mathematics, X.)
Advanced Cryptogamic Botany, 3  (Botany, VI.)
Vegetable Cytology, 3  (Botany, XII.)
Chemistry, 5  (Chemistry, V.)
Political Economy, 5  (Economic Science, I.)
Public Speaking, 2  (Public Speaking, III.)
Debating, 1  (English, VII.)
Histology, 2  (Veterinary Science, XXX.)
English Drama, 3  (Literature, I.)
The Drama in translation, 2  (Literature, VIII.)
Domestic Science, 2  (Domestic Economy, V.)
Entomology, 5  (Zoology, IV.)
Embryology, 3 to 5  (Physics, IX.)
Surveying, 4  (Zoology, V.)
Physiology, 1  (Civil Engineering, VIII.)
History, Europe in the 16th, 17th and 18th Centuries, 3  (History, V.)

*At the beginning of the Junior year students in this course must select a particular science—Botany, Zoology, Physics, Economic Science, Chemistry, Geology, or Mathematics—which shall constitute a line of work during the Junior and Senior years. The hours of study given to the science chosen shall not be less than three per week in each term; and not less than thirty-two hours of scientific work shall be taken during the two years. The scientific work outside of the particular line shall be selected by the student after consultation with the president and the head of the department in which the line of study is chosen. The other studies taken shall be selected by the student after consultation with the president and the heads of the departments having charge of such studies. The studies for each term shall not be less than sixteen nor more than twenty hours per week.

***This subject may be taken only on the recommendation of the professor under whom the student takes the major portion of his work.
SECOND TERM.

Calculus, 5  
Advanced Differential Equations, 3  
Animal Parasites, 2  
Bacteriology, 2  
Systematic Botany, 3 or 5  
Organic Chemistry, 5  
Money and Banking, 2  
Finance, 3  
Public Speaking, 2  
Comparative Anatomy, 5  
Advanced Entomology, 3 to 5  
Debating, 1  
Epic and Lyric Poetry, 5  
Domestic Art, 2  
Mineralogy, 4  
Physical Laboratory, 1 or 2  
Military Science, 1  
Public Speaking, 1, required,  
History, The French Revolution and the XIXth Century, 3  
Human Physiology, 3  
Physical Culture, 1 (for women). Required.  
Economic Botany, 2

SENIOR YEAR.

FIRST TERM.

Spherical Trigonometry and Solid Analytic Geometry, 5  
Anatomy of Domestic Animals, 3  
Economic Problems, 3  
History of Political Economy, 2  
Mineralogy, 4  
History, The Formation of the Union, 3  
History, Diplomatic History of the U. S., 2  
American Literature, 3  
History of Art, 2  
Domestic Art, 2 
Organic Chemistry, 5 or  
Blow-Pipe Analysis and Assaying, 5
Chemistry of the Household, 2  
Psychology, 5  
Agrostology, 2  
Vegetable Pathology, 3 or 5  
Advanced Cryptogamic Botany, 3  
Chemistry, 5  
Public Speaking, 2  
Physical Laboratory, 1 or 2  
Morphology, 3 to 5  
Neurology, 3 to 5  
Principles of American Government, 3  
Advanced Entomology, 3 to 5  
Advanced Physiology, 3 to 5  
Military Science, 1  
One Oration, required  
Botanical Seminar, 1  
The Short Story, 2

SECOND TERM.

Advanced Calculus, 5  
Evolution of Animals, 1  
Astronomy, 5  
Geology, 5  
History, Division and Reunion, 3  
History, The Far Eastern Question, 2  
History of Art, 2  
Domestic Science, 2  
Vegetable Physiology, 2 or 5  
Advanced Bacteriology, 3  
Ethics, 3  
Public Speaking, 2  
Chemistry, 3 or  
Chemistry, 4 or  
Chemistry, 4  
Evolution of Plants, 1  
Advanced Entomology, 3 to 5  
Physical Laboratory, 1 or 2  
Evolution of Cultivated Plants, 1  
Morphology, 3 to 5  
Advanced Physiology, 3 to 5  
Military Science, 1  
Botanical Seminar

### First Term

(Chemistry, XVI and XVI A.)  
(Psychology, I.)  
(Botany, XIII.)  
(Botany, V.)  
(Botany, VI.)  
(Chemistry, XI.)  
(Public Speaking, V.)  
(Physics, XIV.)  
(Zoology, X.)  
(Zoology, XI.)  
(Civics, II.)  
(Zoology, IX.)  
(Zoology, XIV.)  
(Military, VII.)  
(Public Speaking, IX.)  
(Botany, XVIII.)  
(Literature, VI.)

### Second Term

(Mathematics, XVI.)  
(Zoology, VI.)  
(Physics, VII.)  
(Geology, IV.)  
(History, IV.)  
(History, IX.)  
(Domestic Economy, XII.)  
(Domestic Economy, VIII.)  
(Botany, XI.)  
(Botany, VIII.)  
(Psychology, II.)  
(Public Speaking, VI.)  
(Chemistry, XIII.)  
(Chemistry, XXXI.)  
(Chemistry, XXXII.)  
(Botany, XIX.)  
(Zoology, IX.)  
(Physics, XV.)  
(Horticulture, XIIH.)  
(Zoology, X.)  
(Zoology, XV.)  
(Military, VIII.)  
(Botany, XVIII.)
Thesis, required, 1
Industrial History of U. S., 2  (Economic Science, VI.)
Romance and Novel, 3  (Literature, III.)
The Essay, 2  (Literature, VII.)
The State and Federal Government, 3  (Civics, III.)

GENERAL AND DOMESTIC SCIENCE.
(For Women Only.)

ACADEMIC YEAR.

FIRST TERM.

Algebra, 5  (Mathematics, I.)
English, 5 or German, 5  (English, I.)
*German, 5  (Languages, V.)
History, 5  (History, I.)
Elementary Speech, 2  (Public Speaking, I.)
Drawing, 2  (Mechanical Engineering, XIX.)

SECOND TERM.

Algebra, 5  (Mathematics, II or III.)
Plane Geometry, 5  (Mathematics, V.)
Elementary Botany, 2  (Botany, I.)
Elementary Rhetoric, 5 or German, 5  (Languages, VI.)
*German, 5  (History, II.)

FRESHMAN YEAR.

FIRST TERM.

College Algebra, 5  (Mathematics, IV.)
**German, 5 or  (Languages, V or VII.)
French, 5  (Languages, I.)
Domestic Art, 2  (Domestic Economy, I.)
Botany, Ecology, 2  (Botany, II.)
Advanced Rhetoric, 5  (English, III.)
Physical Culture.

SECOND TERM.

Solid Geometry and Trigonometry, 5  (Mathematics, VI.)
**German, 5 or  (Languages, VI or VIII.)

*German may be taken only by those students who can show to the Professor of English satisfactory evidence of proficiency in the English of the Academic year.
**Beginning or Advanced German according to the preparation of the student.
DIVISION OF SCIENCE

French, 5
Domestic Art, 2
Botany, Histology, 4
Gesture and Voice, 1
Composition, 1
Advanced Civics, 2
Physical Culture, 1

SOPHOMORE YEAR.

FIRST TERM.
German, 5 or 4, or
French, 4
Domestic Art, 2
Physics, 5
Composition, 1
**The Drama, 5 or
Analytic Geometry, 5
Europe in the XVth, XVIth and XVIIIth Centuries, 3

SECOND TERM.
Physical Culture,

German, 5 or
French, 4
Domestic Art, 2
Physics, 3
Chemistry, 5
Composition, 1
***Epic and Lyric Poetry, 5 or
****Calculus, 5
Physical Culture.

JUNIOR YEAR.

FIRST TERM.

Domestic Science, 2
Public Speech, 2
Physical Culture.

***Students electing Analytic Geometry will take Literature V as a required study in the Junior year.
****Students electing Calculus will take Literature II as a required study in the Junior year.
*****In the Junior and Senior years a student may take each term not less than sixteen nor more than twenty hours per week. The time given to the sciences—Botany, Zoology, Geology, Physics, Economic Science, Chemistry and Mathematics—shall aggregate not less than thirty-two hours during the two years.
(Electives.)

Chemistry, 5  
Vertebrate Zoology, 5  
Home Decoration, 2  
Bacteriology, 2  
Analytic Geometry, 5  
Political Economy, 5  
Differential Equations, 3  
American Literature, 3  
The Short Story, 2  
Debating, 1  
The Renaissance, 2  
Advanced Interpretation, 2  
Floriculture, 2  
Cryptogamic Botany, 5

(Chemistry, XXIV.)  
(Zoology, II.)  
(Domestic Economy, XII.)  
(Botany, VII.)  
(Mathematics, VIII.)  
(Economic Science, I.)  
(Mathematics, X.)  
(Literature, IV.)  
(Literature, VI.)  
(English, VII.)  
(History, X.)  
(Public Speaking, III.)  
(Horticulture, XI.)  
(Botany, IV.)

SECOND TERM.

(Required.)

Domestic Science, 2  
Advanced Public Speech, 1  
Physical Culture.

(Domestic Economy, III.)  
(Public Speaking, VIII.)

(Electives.)

Chemistry, 5  
Invertebrate Zoology, 5  
Fermentations, 2  
The French Revolution and 19th Century, 3  
The Constitutional History of England, 2  
Calculus, 5  
Advanced Differential Equations, 3  
Money and Banking, 2  
The Essay, 2  
The Novel and Romance, 3  
Debating, 1  
Expression in Oratory, 2  
Ferns, 3  
Bacteriology, 3  
Plant Propagation and Small Fruits, 3  
Market and Home Gardening, 2  
French, 5  
German, 5

(Chemistry, IX.)  
(Zoology, III.)  
(Botany, XXVII.)  
(History, VI.)  
(History, XI.)  
(Mathematics, IX.)  
(Mathematics, XI.)  
(Economic Science, IV.)  
(Economic Science, V.)  
(Literature, VII.)  
(Literature, III.)  
(English, VIII.)  
(Public Speaking, IV.)  
(Botany, XVII.)  
(Botany, VIII.)  
(Horticulture, I.)  
(Horticulture, V.)  
(Languages, II.)  
(Languages, VI.)
DIVISION OF SCIENCE

SENIOR YEAR.

(Required.)

Domestic Science, 2  (Domestic Economy, V.)
Oration, 1  (Public Speaking, IX.)
Thesis, 1

(Electives.)

Chemistry, 5  (Chemistry, XI.)
American Literature, 3  (Literature, IV.)
The Short Story, 2  (Literature, VI.)
Debating, 1  (English, VII.)
Spherical Trigonometry and Solid Analytic Geometry, 5  (Mathematics, VII and XV.)
Formation of the Union, 3  (History, III.)
American Diplomacy, 2  (History, XII.)
Dramatic Art or Extempore Speech, 2  (Public Speaking, V)
Embryology, 3 or 5  (Zoology, V.)
Principles of American Government, 3  (Civics, II.)
Vegetable Cytology, 3  (Botany, XII.)
Botanical Seminar, 1  (Botany, XVIII.)
General Geology, 5  (Geology, II.)
Psychology, 5  (Psychology, I.)
Landscape Gardening, 2  (Horticulture, VIII.)
German, 5  (Language, VII.)
French, 5  (Language, III.)
History of Political Economy, 2  (Economic Science, II.)
Economic Problems, 3  (Economic Science, III.)
Principles of American Government, 3  (Civics, II.)

SECOND TERM.

(Required.)

Domestic Science, 2  (Domestic Economy, VIII.)

(Electives.)

French, 5  (Language, IV.)
German, 5  (Languages, VIII.)
Chemistry,  (Chemistry XVI and XVIa, or XIV.)
The Essay, 2  (Literature, VII.)
The Novel and Romance, 3  (Literature, III.)
Debating, 1  (English, VIII.)
Division and Reunion, 3  (History, IV.)
The Far Eastern Question, 2  (History, IX.)
Advanced Dramatic Art or Advanced Extempore Speech, 2  
(Public Speaking, VI.)

Civics, 3  
State and Federal Constitutions, 3  (Civics, III.)
Systematic Botany, 3 or 5  (Botany, XV.)
Evolution of Plants, 1  (Botany, XIX.)
Botanical Seminar, 1  (Botany, XVIII.)
Comparative Anatomy, 5  (Zoology, VII.)
Geology, 5  (Geology, IV.)
Advanced Calculus, 5  (Mathematics, XVI.)
Industrial History of U. S., 2  (Economic Science, VI.)
Economic Botany, 2  (Botany, X.)
The State and Federal Constitutions, 3  (Civics, III.)

DOMESTIC SCIENCE.
(For Women Only).

ACADEMIC YEAR.

FIRST TERM.

Algebra, 5  (Mathematics, I.)
English, 5 or  
*German, 5  (Languages, V.)
History, 5  (History, I.)
Elementary Speech, 2  (Public Speaking, I.)
Drawing, 2  (Mechanical Engineering, XIX.)

SECOND TERM.

Algebra, 5  (Mathematics, II or III.)
Plane Geometry, 5  (Mathematics, V.)
Elementary Botany, 2  (Botany, I.)
Elementary Rhetoric, 5 or  
*German, 5  (Languages, VI.)
History, 4  (History, II.)

*German may be taken only by those students who can show to the Professor of English satisfactory evidence of proficiency in the English of the Academic year.
FRESHMAN YEAR.

FIRST TERM.

College Algebra, 5
**German, 5 or French, 5
Domestic Art, 2
Botany, Ecology, 2
Advanced Rhetoric, 5
Physical Culture.

SECOND TERM.

Solid Geometry and Trigonometry, 5
**German, 5 or French, 5
Domestic Art, 2
Botany, Histology, 4
Gesture and Voice, 1
Composition, 1
Advanced Civics, 2
Physical Culture.

SOPHOMORE YEAR.

FIRST TERM.

German, 5 or 4, or French, 4
Domestic Art, 2
Physics, 5
Composition, 1
***The Drama, 5 or
Analytic Geometry, 5
Europe in the XVIth, XVIIth and XVIIIth Centuries, 3
Physical Culture.

SECOND TERM.

German, 5 or French, 4
Domestic Art, 2
Physics, 3

**Beginning or Advanced German according to the preparation of the student.
***Students electing Analytic Geometry may take Literature V as an elective in the Senior year.
Chemistry, 5
Composition, 1
*****Epic and Lyric Poetry, 5
Calculus, 5
Physical Culture.

(Chemistry, XXII.)
(English, VI.)
(Literature, II.)
(Mathematics, IX.)

JUNIOR YEAR.

FIRST TERM.

Domestic Science, 4
Chemistry, 5
Vertebrate Zoology, 5
Home Decoration, 2
Bacteriology, 2
Public Speech, 2
Physical Culture.

(Domestic Economy, XIII.)
(Chemistry, XXIV.)
(Zoology, II.)
(Domestic Economy, XII.)
(Botany, VII.)
(Public Speaking, VII.)

SECOND TERM.

Domestic Science, 4
Chemistry, 5
Invertebrate Zoology, 5
Fermentations, 2
The French Revolution and 19th Century, 3
Floriculture, 2
Physical Culture.

(Domestic Economy, XIV.)
(Chemistry, IX.)
(Zoology, III.)
(Botany, XXVII.)
(History, VI.)
(Horticulture, XI.)

SENIOR YEAR.

FIRST TERM.

(Required)
Domestic Science, 3
Physiology, 5
History of Art, 2
Home Sanitation, 1
Oration, 1
Thesis, 1

(Domestic Economy, XV.)
(Zoology, XII.)
(Domestic Economy, XI.)
(Domestic Economy, XVI.)
(Public Speaking, IX.)

(Electives).

Three to seven hours selected from the studies of the first semester of the Junior and Senior years of the General and Domestic Science Course; may include "The Drama" if not taken in the Sophomore year.

*****Students electing Calculus may take Literature II as an elective in the Senior year.
DIVISION OF SCIENCE

SECOND TERM.

(Required)

Domestic Science, 3
Physiology, 5
Dietaries, 2
Thesis, 1

(Domestic Economy, XVII.)
(Zoology, XIII.)
(Domestic Economy, XVIII.)

(Electives).

Five to nine hours selected from the studies of the second semester of the Junior and Senior years of the General and Domestic Science Course may include "Epic and Lyric Poetry" if not taken in the Sophomore year.

DEPARTMENT OF MATHEMATICS.

EDGAR WILLIAMS STANTON, PROFESSOR.
MISS ROBERTS, ASSISTANT PROFESSOR.
MR. PATTENGILL, MISS COLPITTS, MISS FLEMING, MR. JONES
AND MR. TRAVIS, INSTRUCTORS.

The work of the Department of Mathematics is directed to the following ends

(1) The Development of Intellectual Strength.—Such a degree of thoroughness is required as awakens interest and stimulates to earnest effort. The work is so arranged as to compel the student to abandon the mere mechanical methods of reaching results. He can make little or no progress except through the mastery of principles and methods; and in their application there is demanded of him a high degree of ingenuity, care and courage. He is subjected to the continuous discipline of holding details in mind, comparing facts, drawing conclusions and advancing to the discovery of new truth. He learns to think, judge, originate, and through his mathematical training gains mental strength.

(2) Accuracy in Presentation of Mathematical Truths.—The student is required not only to think clearly, but to put his thought into concise and precise English. In the explanation of examples he is asked to bring out and emphasize the principles involved, dealing in detail with such equations only as are necessary to this purpose. In the solution of problems an analysis of statement and equation must be given, definitions and theorems must be stated clearly and accurately and in the demonstration of
propositions the use of correct language is considered as second-
ary only to the employment of correct logic.

(3) The acquirement of such Command of the Subject Mat-
ter of Mathematics as will make it a Valuable Instrument in Higher Scientific and Technical Study.—To this end an effort is made to eradicate from the student's mind the idea entertained by many, that mathematical truths are learned simply to be for-
gotten, and to awaken in its place an earnest desire to obtain a comprehensive and abiding knowledge of the essential facts of the science. Thoroughness in daily recitation is demanded, fre-
quent reviews are given and final credits are made to depend largely upon the student's grasp of principles and the readiness and the accuracy with which he performs the simple and the com-
plex operations involved in their application. Each branch as it is taken up is so presented as to require the constant employ-
ment of the principles and facts of the preceding mathemat-
ic studies. The Department aims in this way to give the stu-
dent such a degree of mathematical maturity and self-reliant mastery as will enable him to use his mathematical knowledge with profit either in advanced collegiate work or as an instructor in our high schools and academies.

In the Engineering Courses, Algebra, Geometry, Trigonom-
etry, Analytical Geometry and Calculus are required studies. Algebra, Geometry and Trigonometry are required in the science courses, while the advanced mathematical work is either optional or elective. Solid Geometry is the only mathematical study required in the courses in agriculture.

The following are the several courses in Mathematics:

COURSE I.—Algebra to Involution.—It is expected that stu-
dents entering this course will have such a knowledge of ele-
mentary algebra to simple equations as may be obtained by thor-
ough work in the high school. If the student's preparation is in excess of this requirement it will be greatly to his advantage.

The subjects included in the review and advance work of this course are those which generally precede involution in any stan-
dard text. They are treated, however, in an exhaustive manner and the examples and problems given are more difficult than those found in the ordinary text-book. Special stress is laid upon the statement of definitions and the demonstration of principles.

COURSE II.—From Involution to Ratio and Proportion. —This course is open to those who have completed Course I. The
following subjects are studied: Involution of Monomials and Polynomials; Evolution, including the consideration of the higher roots of polynomials, and rules for determining the roots of numbers based upon the algebraic method of extracting roots; Radicals, including the fundamental operations, involution, evolution, rationalization, imaginary quantities, extracting the square root of binomial surds and the solution of equations involving radicals; Pure and Affected Quadratics; Equations solved like quadratics; and Simultaneous Quadratic Equations. Frequent written reviews are given covering work in this Course and Course I.

At the completion of this course students are expected to have such grasp of algebra through quadratics as will enable them to handle its principles up to this point without error and perform the operations required, with rapidity and accuracy.

Course III.—Algebra to Ratio and Proportion.—This Course covers practically the same subjects as those enumerated in Courses I and II. Much of the work, however, is taken in rapid review, only one term being devoted to the combined courses. The object aimed at is not elementary instruction in the science, but a wider grasp of principles and familiarity with their application in more difficult fields. Many of the examples assigned are such as are met with in the higher mathematics. The student is thus introduced to a quality of work demanding a broad view of principles and methods and a marked degree of skill in algebraic manipulation.

The course should be undertaken by those only who have already had large experience in algebraic work and who have developed considerable strength in this study. The minimum requirement for entrance is a thorough knowledge of algebra through simple equations. The Course is especially intended, however, for students who have completed algebra in the high school and who need to give the work a thorough review before entering upon advanced work. Admission is secured by examination or upon the certificate of the proper officer of an accredited high school.

Course IV.—College Algebra.—The subjects treated in this Course are ratio, proportion, variation, arithmetical progression, geometrical progression, harmonical progression, the binomial theorem, convergency and divergency of series, theorem of undetermined coefficients including partial fractions.
and reversion of series, principles and use of logarithms, permutations and combinations, probability and the theory of equations.

The Course is open to students of the College who have taken Courses I and II or Course III; also to graduates of the fully accredited high schools who furnish the proper certificates. The first ten days of the time allotted to the course is devoted to a review of algebra up to and including quadratics. Students who fail to stand the test of this review will be assigned to such work as they are prepared to undertake.

Graduates of accredited schools are earnestly urged to carefully review their work in algebra before entering this course. The sample questions printed elsewhere in this catalogue give a good idea of the knowledge of the subject needed. The Department will gladly unite with the student and his school principal in arranging to test the thoroughness of his home review; such test can be given in connection with the work of the high school and, if satisfactory to the Department, will be accepted in lieu of the review test at the College. The student can then begin his advanced work without delay. Students designing to take the review here must be present promptly at the opening of the term. Correspondence regarding this whole matter is cordially invited.

Students not graduates of the fully accredited schools will be admitted to this course upon passing a satisfactory examination upon the work covered by Course III. As stated under "Requirements for Admission," arrangements can be made with the principals of high schools or county superintendents to conduct such examinations. The principal of any school desiring to test the ability of his students to enter upon the work of this course will be furnished, upon request, a list of examination questions. The Department will be pleased to mark the examination papers and enter upon its records as accredited students in the Mathematical Department the names of all students who show that they are prepared to take up the work with success.

Course V.—Plane Geometry.—The topics included in this course are those usually treated in a standard text. They include the fundamental definitions and axioms, theorems relating to rectilinear figures and the circle, measurement of angles; doctrine of limits; theory of proportion; similar polygons; comparison and measurement of the surfaces of rectilinear figures; measurement of the circle, and geometrical construction of plane figures. The
text book used is Phillips and Fisher. The proofs outlined in the text must be fully amplified; definitions must be stated with precision; authority cited must be given in full and the logical steps in demonstration must be so arranged and presented as to constitute a complete and rigid proof. The student must understand each proposition and be able to state the demonstration in concise geometric language. Special emphasis will be laid upon the demonstration of original exercises. The course is open to those who furnish the head of the department with satisfactory evidence that they have a thorough knowledge of the subjects in Course I.

Course VI.—(a) Solid and Spherical Geometry.—This course is open to those who have met the requirements for admission to the mathematics of the second term of the Freshman year. A week is given at the beginning to a review of plane geometry, one day being devoted to each book. Students are required to write out or demonstrate orally such propositions as may be assigned, using in preparation the text book studied in the preparatory school. Looking forward to this work the students immediately before leaving home should carefully go over the whole subject of plane geometry. Those who show in the week's review a satisfactory knowledge of definitions and ability to handle successfully advanced geometric work will be assigned to the classes in solid geometry. The subjects considered in the remainder of the course will be the properties of planes, of diedral and polyedral angles, of prisms, of pyramids and other polyedrons, of cylinders, cones and spheres, of spherical triangles and spherical polygons.

(b) Plane Trigonometry.—Courses III, IV, V, and VIa are essential preliminary studies. The subjects investigated are definitions; positive and negative angles; circular measures of angles; operations upon angles; functions of angles, their relations and varying values; determination of values of the functions of particular angles; functions of different angles expressed in terms of those of a basal angle; derivation and reduction of trigonometric formulas; solution of right and oblique triangles. The points most strongly emphasized are: Care in tracing the trigonometric functions of varying angles in the different quadrants, readiness and skill in the derivation and reduction of trigonometric formulas, and accuracy in the use of logarithmic tables.
COURSE VII.—Spherical Trigonometry.—This work is required in the first term, Junior year, of the Civil Engineering course. It is elective to students in the science and domestic science course. Course VI and the studies necessarily preliminary there-to are required for entrance. The spherical right triangle is investigated; triangles of reference are formed and formulas deduced therefrom; Napier's rules are applied; the six different cases arising in the solution of right triangles are discussed and illustrated by numerous examples. Spherical triangles in general are considered; the formulas relating thereto are derived and applied to the solution of examples; interesting problems connected with the celestial spheres are included in the course.

COURSE VIII.—Plane Analytic Geometry.—This subject is taught largely from the standpoint of its value as a disciplinary study. Once the student is impressed with the spirit of its method, the beauty of its logic and the excellent field for analytical reasoning it opens up, he will readily find his way to a mastery of the particular facts it reveals. The student is introduced to the subject through a review of the special algebraic, trigonometric and geometric conceptions upon which it is based; these are applied to the analytic representation of points in a plane and the proposition established that all geometric lines and curves can be represented by equations, and their properties and relations discovered by a study of these equations. The line, the circle and the conic sections are in this way most carefully investigated. Examples involving principles are solved and from a knowledge of particular the student is led to the demonstration of general theorems. The generalized truth is then employed in the development of other truth, and thus the student is given a most excellent drill in both inductive and deductive reasoning. At the same time his needs, as an engineering or scientific student, of a knowledge of the facts of analytic geometry, are fully met. The Analytic Geometry by Tanner and Allen of Cornell University is used as a text.

COURSE IX.—Differential and Integral Calculus.—All preceding mathematical work should be completed before this course is undertaken. Calculus bears to that work the double relation that, while it is based upon it and cannot be pursued successfully except as the work has been well mastered, it on the other hand furnishes a most excellent opportunity for a general review of the preceding mathematical studies and gives to all
that has gone before a significance and value which it would otherwise lack. It is therefore a most important part of any extended and thorough mathematical course. The abstruse principles of this higher method of mathematical investigation are explained upon the theory of limits. The theory of infinitessimals is also employed. Instruction is given by daily recitations with a review of the week's work each Friday. In differential calculus the rules of differentiation, expansion of functions, indeterminate forms, tangents, normals and asymptotes, direction of curvature, points of inflection, radius of curvature, order of contact, the osculating circle, envelopes, singular points and maxima and minima of functions are studied. In integral calculus much time is spent in acquiring a usable knowledge of the forms of integration. Application of integration is then made to the determination of the lengths of plane curves, areas of plane surfaces and surfaces of revolution, volumes of solids of revolution and other solids.

**Course X. — Differential Equations.**—This course is required of electrical engineers and is open to all students of the College who have completed Course IX. The work covered by it may be considered as supplementary to integral calculus. The course includes the formation of differential equations; solutions of equations of the first order with applications to geometry, mechanics and physics.

**Course XI. — Differential Equations.**—This course is open to those who have completed Course X. The subjects covered are the methods of handling linear equations with constant and variable coefficients; exact differential equations; integration in series; equations of the second order with geometrical, mechanical and physical applications; ordinary differential equations with more than two variables; partial differential equations of the different orders.

**Course XII. — Algebra through Quadratics.**—Given first term, Academic year. This course, which is designed especially for students in agriculture, covers the work in Course III. To complete it successfully in the time allowed the student should have knowledge of at least the fundamental operations. It will be greatly to his advantage if he has taken the work as far as involution.

**Course XIII. — Algebra; Permutations and Combinations, Binomial Theorem and Logarithms.**—Given second term, Academic year, agricultural courses. Four weeks are devoted to this sub-
ject. The work includes permutations and combinations; the binomial theorem and logarithms.

Course XV.—Advanced Analytic Geometry.—In the last ten weeks of the first semester, advanced work in analytic geometry will be taken up. Some time will be devoted to the general equation of the second degree and to higher plane curves, after which the study of analytic geometry of three dimensions will be considered.

Course XVI.—Advanced Calculus.—This course deals with the application of differential calculus to the discussion of the properties of curves. It treats of the application of both differential and integral calculus to functions of a complex variable and also investigates the subject of definite integrals and the use of double integration in measuring surfaces. The principles involved are illustrated by numerous examples.

THE DEPARTMENT OF PHYSICS.

LOUIS BEVIER SPINNEY, PROFESSOR.
MR. TUXTLEF AND MR. WENNER, INSTRUCTORS.

This department is located in Engineering Hall. It occupies sixteen commodious rooms, including six laboratories, two standardizing and testing rooms, two research rooms, two apparatus rooms, three offices and a large lecture room.

The lecture room is modern in its equipment, which includes a convenient system of darkening shutters for the windows and a large permanent lantern screen, to facilitate demonstration work. At the lecture room tables are electric, gas and water connections, placing at the disposal of the lecturer a water pressure of fifty pounds per square inch and electric currents from storage batteries, and direct or alternating current dynamos.

The department has a good equipment in apparatus for demonstration purposes, which is stored in apparatus rooms adjoining the lecture room.

The general laboratory rooms are large and well lighted and are equipped with heavy oak tables, slate-top piers and wall tables with heavy stone tops for the support of the laboratory apparatus. Convenient electric, gas and water connections are provided. A very serviceable equipment in the apparatus used in general physical laboratory work is furnished. Among other apparatus may be mentioned a laboratory clock, with electric connections,
chronograph, a reversion pendulum, two torsion pendulums for the experimental determination of "moment of inertia" and the "coefficient of simple rigidity," a physical pendulum, apparatus for the determination of the "intensity of gravity" by observations on a body rolling on an inclined plane, analytical balances, Jolly's balance, hydrostatic balance, apparatus for the determination of "Young's Modulus" by stretching and by bending, apparatus for the coefficient of linear expansion, a cathetometer, optical benches, telescopes and microscopes, spectrosopes, a saccharimeter, hydrometers, thermometers, barometers, galvanometers, Wheatstone bridges, "testing apparatus," electro-calorimeters, silver, copper and water voltameters, etc.

The photometry rooms are equipped with several photometer benches and are furnished with gas and electric connections. The arrangement of apparatus is made with a view of facilitating the regulation tests of arc and incandescent lamps as well as those of other sources of illumination.

The dynamo room is equipped with experimental dynamos, including arc machines and direct and alternating current machinery of various types together with a convenient switch-board and extended system of electric connections. An equipment in ammeters, voltmeters, wattmeters, transformers, dynamometers, etc., is provided.

The repair shop is fitted with an engine lathe, a speed drill, a set of machinist's and carpenter's tools and a stock of shop supplies. This room is used for the repair and manufacture of apparatus.

The photographic laboratory is equipped with cameras and other appliances, dark rooms, skylights, screens, and back grounds for portrait and copying work, and water facilities. The equipment enables the carrying forward of a very practical course in photography in its various applications.

The following courses are offered by the department:

Course I.—Mechanics and Heat.—First term, and

Course II.—Electricity and Magnetism and Light and Sound.—Second term. Two lectures, one recitation and one laboratory per week. Mathematics IV, V and VI required.

In the first term of this course the study of mass, force, energy, and power is emphasized and special attention is given to the graphic methods of solving problems in force-actions, velocities, etc. A portion of this term is also given over to the discus-
sion of radiation in general and wave motion. The other general topics are then taken up according to the outline given above.

The laboratory work is kept parallel to the text-book and lecture work and enables the emphasizing and fixing of the fundamental conceptions.

This course is designed to meet the needs of students in the course of domestic science. The breadth of the course together with the emphasis which is placed upon the essentials, adapt it to the needs of teachers and others who desire a general training in physics. Professor Spinney, Mr. Tuttle and Mr. Wenner.

COURSE III.—Mechanics and Heat.—First term, and

COURSE IV.—Electricity and Magnetism and Light and Sound.—Second term. Two lectures and three recitations per week. Mathematics IV, V and VI required.

This course is designed for engineering and general science students, although it is open to others who are properly prepared for the work. As in Course I, much stress is placed upon the fundamental principles of the work and in addition thereto a more thorough study of vector quantities and their graphical treatment is made.

A view of the subject from the mathematical standpoint is emphasized and the student is urged to familiarize himself with the theoretical side of the question, as it is believed that such a foundation is very helpful if not absolutely essential to the work which follows. Text-book, Hastings and Beach, "General Physics." Professor Spinney, Mr. Tuttle and Mr. Wenner.

COURSE VI.—Electricity and Magnetism.—Three hours per week. First term. Physics III and IV and Mathematics IX required.


COURSE IX.—Theory and Practice of Photography.—Class room and laboratory work, one hour each per week. First term. Open to upper classmen only, upon recommendation by the head of the department in which the student takes his major work.

In the class room work is given a discussion of the optics and chemistry of photography. The manipulation of the negative
and positive under the various processes to which it is subjected is also presented and the laboratory work is planned to give the student some skill in carrying forward the various methods of practical photography. The student is given practice in developing over and under exposed negatives, in copying and enlarging work, etc. Mr. Tuttle.

**Course X.**—*Dynamo Electric Machinery.*—Four hours per week. Second term. Prerequisite: Physics VI. Professor Lanphear.

**Course XI.**—*Alternating Currents.*—Four hours per week. First term. Physics X required. Professor Spinney.

**Course XII.**—*Applied Electricity.*—Four lectures per week. Second term. Physics XI required. Professor Spinney.

**Course XIV.**—*General Physical Laboratory.*—Two afternoons per week. First term, or

**Course XIV A.**—One afternoon per week, First term. Measurement of length, mass, and time, determination of physical constants, use of the barometer, thermometry; calorimetry, etc. Mr. Tuttle and Mr. Wenner.

**Course XIV B.**—One afternoon per week. Second term. Continuation of XIV A.

**Course XV.**—*Physical Laboratory, Elementary Electrical Measurements.*—One afternoon per week, Second term, or

**Course XVI.**—Two afternoons per week, First term, or

**Course XVII.**—Two afternoons per week, Second term. The measurement of the electro-motive force and internal resistance of primary and secondary batteries, the use of Wheatstone's bridge, measurement of current, determination of galvanometer constants, high resistance measurements and insulation tests, etc. Mr. Tuttle and Mr. Wenner.

**Course XVIII.**—*Physical Laboratory, Electrical Testing.*—Two afternoons per week, First Term, or

**Course XIX.**—Two afternoons per week, Second Term. Professor Spinney, Mr. Tuttle and Mr. Wenner.

**Course XX.** *Physical Laboratory, Dynamo, Motor and Commercial Plant Testing.* Two afternoons per week, first term.
The efficiency of dynamos and motors, experimental determination of characteristic curves, magnetic leakage, etc. Critical study of commercial plants, determination of efficiencies, etc. Professor Lanphear and Mr. Mereness.

**Course XXA.**—*Physical Laboratory. Study of alternating currents.* One afternoon per week, first term. Laboratory methods for measuring inductance, capacity, etc., and,

**Course XXI.**—*Physical Laboratory. Study of alternating currents.* Two afternoons per week, second term, Senior year.

Continuation of XXA. The study of alternating current dynamos and motors and commercial transformers. Professor Spinney and Mr. Mereness.

**Course XXII.**—*Electric Circuits.*—Two lectures per week, Second Term. Physics VI required. Professor Lanphear.

**Course XXIII.**—*Electrical Designing.*—Batteries, commercial ammeters, voltmeters, wattmeters, etc. One afternoon per week, Second Term, Junior year, and

**Course XXIV.**—*Electrical Designing.*—Two afternoons per week, First Term, Senior year. The design of dynamos, motors, transformers, etc. Professor Lanphear.

**Course XXV.**—*Electrical Designing.*—Three afternoons per week, Second Term, Senior year. Continuation of Course XXIV. Professor Lanphear.

**Course XXVI.**—Thesis in Electrical Engineering begun, and

**Course XXVII.**—Thesis in Electrical Engineering, finished

Total equivalent of four hours per week for one term.

**Course XXVIII.**—Thesis in Physics.

For a discussion of Courses X to XIII, XVIII to XXVII and XXIX to XXXII, see the Course in Electrical Engineering.

The department offers thesis work in general physics, in heat, in light and sound, and in electricity and magnetism to students in other than the engineering courses.

Courses III and IV and Courses X to XV are designed especially for engineering students. Courses III, IV, XIV, XV, XVI and XVII are, however, open to other students as electives.

A fee of $5.00 per term is charged for Courses XIV, XVI, XVII, XVIII, XIX, XX and XXI. For Course XV the fee is $3.00. If the student elects but one hour the fee is $3.00.

The fee for Course IX is $3.00.
The study of chemistry begins in the Sophomore Year with all students, excepting those in the courses in Veterinary Science and in General and Domestic Science, who begin their work the first semester of the Freshman Year.

METHODS AND OBJECT OF INSTRUCTION.

The aim of the instruction in Chemistry is to develop in the student the inductive and experimental method of study, to excite in him an appreciation and love for true experimentation and to train his powers for inductive thinking, thus laying a foundation for technical or applied Chemistry.

The method of study is, therefore, distinctively the laboratory method. On the average, the student employs two hours of time in laboratory study for every hour of recitation. This proportion of time for the two divisions of work is especially carried out in the earlier part of the class study. The class room work aims to fix in the mind of the student chemical principles and facts based upon what has been learned by the actual handling and study of chemical substances.

The work is arranged in courses, the course referring to the pursuit of a division of the subject for one semester without regard to the number of hours per week that may be devoted to it. Three hours of laboratory study is equivalent to one hour of recitation.

DESCRIPTION OF COURSES OF STUDY.

The work is conveniently grouped under the following general heads: (a) General and Descriptive Chemistry; (b) Analytical Chemistry, Qualitative and Quantitative Analysis; (c) Organic Chemistry; (d) Studies in Applied Chemistry.

(a) General and Descriptive Chemistry includes an elementary study of the non-metallic and metallic elements, their history, occurrence, preparation, properties and their principal compounds. In order better to train his powers of observation the student is required to describe the apparatus used and the phe-
nomina produced, and to trace the relation of the results obtained to laws and principles.

The different courses in General and Descriptive Chemistry are arranged to meet, as far as is practicable, the special needs of the students of the various departments. However, it is recognized that at this stage of the work the Science of Chemistry is the student's most practical acquisition.

(b) Analytical Chemistry, both Qualitative and Quantitative, is taken up in an elementary way at first and may be followed by courses in more advanced work. After this preliminary knowledge is obtained, the direction of the work will depend to a great extent on the degree the student is aiming to obtain. For the degree in Agriculture the analytical study is directed to an examination of those substances of agricultural interest, and to prepare the student for an intelligent use of the scientific data upon which agriculture is founded. In any case the purpose is to study Applied Chemistry from the standpoint of its fundamental principles.

In the recitations, methods of analysis are described and discussed and the study of the theoretical chemistry carried forward. In this work, courses of study are arranged for graduate as well as for under-graduate students.

(c) In Organic Chemistry, courses are offered for the first degree and also as major and minor for graduate students.

The course required of the students of the Veterinary Department is of an elementary nature and is intended to give a sufficient knowledge of the subject to lay the foundation for the study of Physiological Chemistry which follows. The latter course considers the chemical changes going on in the living animal body; the essential composition of foods and the changes through which they pass in the animal economy; the chemistry of the secretion and excretion. The laboratory study is devoted to the three principal food constituents and to urine analysis.

The undergraduate in the division of Agriculture under the topic Organic Chemistry, studies in addition to the general principles of the subject, the chief food substances, i.e., the carbohydrates, fats, and proteids, poisonous substances found in the organic world, such as the alkaloids, ptomaines; the chemistry of milk and of the manufacture of butter and cheese. In a word, the student will consider, as completely as the time allotted to the subject will allow, the important questions that concern agriculture from the chemical standpoint.
To under-graduate students in the Division of Science is given a fairly complete outline of the theory of the structure and formation of organic compounds, but special attention is given to those compounds that are of commercial importance. In the laboratory the student prepares many of the more important manufactured organic substances, such as alcohol and soaps, and makes a special study of vinegars, sugar, petroleum and its products, glycerine, etc.

With this work as a foundation the graduate student selects some feature or features for more complete study. The amount and character of the work is left for arrangement between the individual and the head of the department. However, this will embrace such work as the analysis and study of foods, oils, fats, and the methods of preparation, purification, and adulteration of commercial organic substances.

(d) It is recognized among persons whose opinions are worthy of consideration that the application of any science to the problems of life can be profitably taken up by the student only after a thorough grounding in the principles upon which the science rests. The purpose of the preliminary courses in this subject is to give this training as completely as possible.

Some eighteen courses of study in applied chemistry are offered, or are required of the students for the various degrees open to them. In the nature of the case, this work is essentially quantitative analysis and consists of courses in the analysis of Agricultural products; Fuel and Gas Analysis; Blowpipe Analysis; Assaying and Metallurgy; Chemistry of the Household; The Preparation of Organic and Inorganic Compounds.

The courses in Agricultural Analysis will include both inorganic and organic substances; such as: soils, fertilizers, water, fodders and dairy products. This work will be open to under-graduate and graduate students, i. e.: the latter class of students will carry forward the work begun in the usual college courses.

The course in Fuel and Gas Analysis will consist of the study of solid, liquid and gaseous fuels, in reference to their composition, and to their relative economic values. The student may devote the time of this course, principally, to technical analysis. Although the work is largely done in the laboratory it will be supplemented by lectures and recitations. The standard forms of apparatus will be used.
The principles and methods of quantitative analysis learned in the elementary course will be applied in the advanced work to the analysis of various organic and inorganic substances, such as foods, iron and steel. The application of the facts of Electrochemistry to the quantitative analysis of ores, and in the manufacture of chemicals will be studied in an elementary manner.

Quantitative Analysis by the "fire methods" is applied to gold, silver, copper and lead ores. This work is introduced by a blowpipe study of minerals, and is intended to support and supplement the subject of Descriptive Mineralogy and Crystallography which are studied in the Department of Geology.

The study of Metallurgy will consider the chemical changes going on in the separation of the principal metals of the industries and the assaying of metallurgical substances by wet process. This will include the chemical changes in the ores, fluxes, and fuels, occurring during the processes in the preparation of metals, and also the quantitative analysis of such substances. The subject is considered in lectures, recitations and laboratory practice.

The courses in chemical preparations will include the formation of pure and commercial articles from raw materials, and the common adulterations of these products.

The Chemistry of the Household considers the elementary chemistry of the principal food materials, changes produced in them during cooking and digestion, of cleaning and of adulteration of the chief food substances.

This course can be accompanied by a laboratory study of soaps, soap preparations, sugars, syrups, vinegars, and baking powders. It must be preceded by a course in elementary quantitative analysis.

The work in Water Analysis covers a study of the methods employed, namely the so-called mineral and sanitary analysis, and the interpretation of these results, especially from the standpoint of the household, and for use in boilers in the production of steam. Methods of purification of water and a study of sewage will receive attention.

COURSES OF INSTRUCTION.

FIRST SEMESTER.

Course I.—Elementary Inorganic Chemistry.—Recitations two hours. Laboratory practice, one afternoon. Veterinarians. Freshmen.
COURSE III.—General Chemistry.—Recitations, three hours. Laboratory practice two afternoons. Engineers, Sophomores.

COURSE V.—Qualitative Analysis.—Recitations, three hours. Laboratory practice, two afternoons. Continuation of Course II. Junior or Senior year.

COURSE VII.—Blowpipe Analysis. Recitations, two, and laboratory practice three afternoons for one-half semester. Required of Mining Engineering students, and elective for students of Division of Science. Junior year. Courses II and V, or III and VI, required.

COURSE VIII.—Assaying. Recitations, two hours, and laboratory practice, three afternoons for one-half semester. Junior year. Required of Mining Engineering students. Elective for students in Division of Science. Junior year. Courses II and V, or III and VI, required.

COURSE X.—Elementary Organic Chemistry.—Lectures two hours. For students in the Veterinary Department only. Junior year.

COURSE XI.—Quantitative Analysis. Recitations, two hours. Laboratory practice, three afternoons. Junior and Senior years. Must be preceded by Courses II and V or III and VI.

COURSE XIV.—Organic Chemistry. Five hours. A continuation of Course IX. Work subject to arrangement by head of department and student. Senior year, or as a major or minor graduate study.

COURSE XVI.—Chemistry of the Household. Sixteen lectures. Senior year. Must be preceded by Courses XXII, XXIV and IX. Offered to students of science as related to the industries, and in domestic science.

COURSE XVI (a).—This course is to accompany Course XVI and is wholly laboratory study. Senior year. Must be preceded by Courses XXII, XXIV, IX and XI. Domestic Science students, one or two afternoons.

COURSE XVII.—Fuel and Gas Analysis. Three hours. Elective for students of Division of Science. Courses II, V and IX, required. Major or minor graduate study.

COURSE XVIII.—Electro-chemistry. Three hours. Senior year. Elective for students of Division of Science. Courses II and V required. Major or minor graduate study.

COURSE XXI.—For students in the Agricultural Division, which see.
COURSE XXII.—Elementary Chemistry. Recitations three hours. Laboratory practice two afternoons. G. D. S. students. Freshmen.

Courses XXV, XXVII, XXVIII are for students in the Agricultural Division, which see.

COURSE XXX.—Continuation of Course XII.—Two hours—Mostly laboratory practice. Senior year. Courses II, V and XII required when elected by Division of Science students. Required of Mining Engineering students.

COURSE XXXIII.—Qualitative Analysis. Continuation of Course V. Recitation two hours. Laboratory practice two or three afternoons. Elective Junior or Senior years. Division of Science.

SECOND SEMESTER.

COURSE II.—General Chemistry. Recitations, three hours. Laboratory practice, two afternoons. Sophomore year. Division of Science Courses.

COURSE IV.—General Chemistry (Metals.) Recitations, two hours. Laboratory practice, one afternoon. Freshmen. Veterinary Science students only.

COURSE VI.—Qualitative Analysis. Recitations, three hours. Laboratory practice, two afternoons. Continuation of Course III.

COURSE IX.—Organic Chemistry. Recitations, four hours. Laboratory practice, one afternoon. Junior or Senior years. Must be preceded by Courses II and V.


COURSE XIII.—Physiological Chemistry. Recitations, two hours. Laboratory practice, one afternoon. Junior and Senior years. Required for students in Veterinary Department. Elective in Division of Science. Courses II, V and IX, required when elected.

COURSE XV.—Analysis of Foods. Three hours. Elective for students in Division of Science. Courses II, V and IX, required. Major or minor graduate study.

COURSE XIX.—Water Analysis. Three hours. Senior year. Elective for students in Division of Science. Courses II, V and XI, required. Major or minor graduate study.
Course XX.—Special Work in Chemistry for the Preparation of a Graduate Thesis.—This subject is usually selected along the line of applied chemistry.

Course XXIII.—For students in the Agricultural Division, which see

Course XXIV.—Elementary Applied Chemistry. Recitations, three hours. Laboratory practice, two afternoons. G. D. S. students. Freshmen.

Courses XXVI and XXIX.—For students in the Agricultural Division, which see

Course XXXI.—Inorganic Preparations. Recitations, two hours. Laboratory practice, two or three afternoons. Courses II, V, required. Elective in Division of Science.

Course XXXII.—Quantitative Analysis.—Continuation of Course XI. Recitation and Laboratory practice, four hours. Elective Junior or Senior years. Division of Science.

Graduate students will be provided with work in Organic and Inorganic Chemistry extending through two years if desired.

This subject is open as a major study to graduates of this and other colleges of equal standing who have pursued the study of chemistry for two years and who are by this prepared to carry on independent work in the various directions that may be arranged by them and the head of the Department. The courses of study will be along the lines of Applied or Industrial Chemistry with a sufficient ground work of theoretical study to give a rational explanation and conception of the processes involved. The work will include advanced analytical and synthetical chemistry, i. e., a study of the methods of chemical analysis and of the preparation of organic and inorganic compounds of industrial and commercial importance. The graduate student will select work along some one of these general lines of study and will devote his time to this, supporting it by other necessary collateral study, and such research in the literature of the subject as the library facilities will permit. A good reading knowledge of the German language will be essential to good progress in the prosecution of the work. Minor subjects in this department will be arranged so as to help as much as is possible the major subjects selected in the other departments.
EQUIPMENT AND ACCOMMODATIONS.

The Chemical department occupies the whole of the four floors of the building known as Chemical Hall. The building is "T" shaped with a front 70 feet by 40 feet and a wing 60 feet by 32 feet. The space is divided into twenty-seven rooms, ten of which are laboratories, the remainder being lecture, office, balance, and store rooms.

The laboratories contain working tables which by a system of lockers can accommodate six hundred students. The assaying laboratory is well supplied with tables, furnaces and other apparatus for fire assaying. The laboratory for the course in blow piping is fitted with air blast and all of the usual conveniences for such laboratories.

The department is well supplied with accurate weights and balances for the courses involving quantitative analysis.

The department is amply equipped with apparatus and chemicals for all of the work outlined in the courses of study offered.

Persons desiring to prepare themselves to become teachers of chemistry, analytical chemists, or those seeking a preparation for the study of medicine will find here good facilities for study. The expenses are only sufficient to cover the actual cost of the material used in the prosecution of the work.

AGRICULTURAL CHEMISTRY.

A. A. BENNETT, PROFESSOR.

ASSISTANT PROFESSOR.

The aim of the work in Agricultural Chemistry is twofold; namely, to give the student a fundamental knowledge of chemistry, and then to apply this knowledge to the chemical problems of agriculture.

A sufficient amount of time during the first year and a half of study is applied to the acquiring of chemical principles and relations, yet at the same time the application of these facts is considered and constitutes a portion of the work. In other words the study of the science of chemistry accompanies its application to agricultural questions. The later work of the courses is principally devoted to applied chemistry.

The courses of study open to the undergraduate student are briefly described as follows:
COURSE XXI.—Elementary Experimental Chemistry.—This is the introductory work for the students in the agricultural courses and is intended to give knowledge of matter by actual handling and experience with it. The recitations are upon the laboratory work for the purpose of obtaining a first-hand knowledge of chemical changes. The student learns how, and the necessity for taking notes of useful data how to interpret these facts and apply them to common chemical changes that are going on in nature. The course includes a study of the so-called non-metallic elements that are present in the air and soils, etc. There are three recitations and two afternoons of laboratory practice per week. First Semester, Sophomore Year.

COURSE XXIII.—This course is a continuation of Course XXI, dealing with the metallic elements and their relations to those studied in the preceding term. In this course the student becomes acquainted with the basic elements in the soil and their relations to non-metallic compounds, i.e., the acids and their place in the formations of salts. He learns how to separate and recognize these elements, their compounds, preparatory to determining them quantitatively. Three recitations and two afternoons of laboratory work are required each week. Second semester, Sophomore Year.

COURSE XXV.—Organic Chemistry.—This course follows regularly Courses XXI and XXIII and deals with substances produced by animal and plant life. The laboratory study brings the student in touch with the properties and methods of preparing organic food material. The sugars, starches and proteids, the simpler food material will be studied and at the same time the fundamentals of organic chemistry will be required. The work is divided into three recitations and one laboratory periods per week, during the First Semester, Junior Year.

COURSE XXVI.—Chemistry Applied to Agriculture.—This work will be introduced in the laboratory study by quantitative analysis of inorganic substances followed by analyses of soils, fertilizers and other inorganic substances related to agricultural processes. The recitation work, two hours per week, will follow the laboratory practice and be accompanied by text book and lecture study.

COURSE XXVII.—Chemistry Applied to Agriculture.—This course will consider in an elementary manner the organic phase of Agricultural Chemistry and will deal with the chemical
changes in foods during digestion and assimilation, and the changes that occur in the plant and animal body. Some time will be devoted to dairy products and especially to the methods of analyzing such substances for adulteration. Laboratory practice will occupy two afternoons per week.

Course XXXIV.—This is a continuation of Course XXVII. It is expected that the student electing this work will take up some special line of investigation as a result of the work done in the courses that have preceded it. The requisite courses are XXI, XXIII, XXV, XXVI, XXVII. For example, the student may desire to investigate somewhat fully the kind and character of organic matter in fertile soils; the effect of the composition of food on the composition of milk, as a whole or as to any of its constituents; changes in the composition of cheese during ripening, etc. This course is intended to take the student into the subject as far as can be profitably done by the undergraduate.

The time devoted to the subject is not less than three hours nor more than five hours per week in the second semester of the senior year. The work is largely done in the laboratory but is supplemented by consulting authorities and conferences with the instructor.

Course XXVIII.—Dairy Chemistry.—Lectures and laboratory practice. This course is for students in the one year course in dairying, and will be arranged to fit the needs and the preparation of such students, but it will be an elementary character throughout. First Semester.

Course XXIX.—Continuation of Course XXVIII. Second Semester.

Graduate Work in Agricultural Chemistry.

Advanced work in agricultural chemistry leading to the master's degree in scientific agriculture may be selected either as a major or minor study. This work may be taken in the chemical department as a continuation of the work begun as an undergraduate student may elect to do this work with the chemical section of the Experiment Station, thus coming in touch with the research work and investigations being carried on there. The following courses of graduate work are offered:

Course I.—Chemistry of Soils.—This course embraces a study in soil chemistry and its relation to plant life, including the chemical composition, its relation to fertility, the determination of available plant food, fertilizers and other substances which
are effective in the production of crops, also the study of rain and drainage waters, the loss of plant food due to improper drainage and other conditions.

COURSE II.—Chemistry of Dairying.—This work will cover a general survey of the field of chemistry applied to dairy problems such as the composition and chemical changes of butter, milk and cheese, and also other oils and fats used as food products and for adulteration.

COURSE III.—Chemistry of Feeds.—This course includes a careful study of the chemistry of plants and field crops, such as the chemical composition of corn, wheat and oats, methods of modifying and improving the chemical composition by selection and plant breeding, chemical study of growing plants during the various stages of development, etc., the effects of various elements in the soil on the composition and quality and the yield or productiveness of the grain and forage crops. The study of the chemical composition and nutriments of the various refuse and by-products used for stock feeding.

COURSE IV.—Chemistry of Horticulture.—This course includes a careful study of the chemical composition of fruits including the influence of various elements present in the soil on the composition, quality and productiveness of the orchard, vineyard or garden; also the influence of climatic conditions upon the composition and quality of fruits, and the influence of selection and breeding.

DEPARTMENT OF BOTANY.

LOUIS HERMANN PAMMEL, PROFESSOR.
R. E. BUCHANAN, H. S. FAWCETT, EDNA L. KING, ASSISTANTS.

GENERAL EQUIPMENT.

The Department of Botany has temporary quarters on the first floor of Margaret Hall and in part of the annex. The room is divided up into sections permitting instruction in Botany I and II as well as the advanced work. For this purpose we have ten research tables, five large laboratory tables and ten tables for the students in Botany I and II. The lecture room is in the west end of the room and has a seating capacity for ninety students. There are charts for the purpose of illustration and mounted specimens of weeds, diseases of plants, etc. There are twenty-five compound microscopes of the following makes:
Bausch & Lomb, Zeiss, Leitz & Beck, also microtomes, various accessories and reagents for the purpose of doing cytological work. The bacteriological laboratory has a general equipment consisting of the various forms of apparatus, Arnold’s steam sterilizer, Koch’s steam sterilizer, dry oven for dry sterilization, blood serum sterilizer, platinum needles, plate holders for plates, glass benches for support of plates, petri dishes, culture, leveling tripod, incubator, and thermo-regulator, etc. The department is provided with a large collection of microscopic slides and lantern views.

The Department of Botany offers excellent facilities, not only to the undergraduate students but to the graduate students along the lines of economic and systematic botany, mycology and bacteriology.

**HERBARIUM.**

The various collections of the Department now amount to about 60,000 specimens. The herbarium is very full in plants from Iowa and the Mississippi Valley, besides having a large number of plants from the eastern states, California and Europe. The collection may be divided into the general phanerogamic herbarium which was started by Dr. C. E. Bessey and continued by Dr. Halsted, to which numerous specimens have been added during the last few years, the Parry collection and the cryptogamic collection.

**Grass Collection.**—The college herbarium contains an excellent collection of grasses, having material from every part of the state, besides a very representative collection from various parts of the United States and Europe. This is invaluable for students of Agrostology.

**The Parry Collection.**—This contains 22,000 specimens. It was purchased at considerable expense from Mrs. Parry and contains hundreds of new species found by Dr. Parry on his collecting trips, and is especially rich in plants of California, Mexico and the Rocky Mountain region. Many of these specimens were collected before the advent of the railroad. Many of the specimens contained in the collection are type specimens and are thus invaluable.

**Dendrological Collection.**—The college herbarium has a good representative collection for dendrological study. Many of the trees are likewise represented by photographs of the living trees. Of these photographs we have several thousand
from Iowa and other Mississippi Valley states and the Rocky Mountains.

**Economic.**—Aside from the economic trees the department has an excellent collection of the cultivated plants of the United States and Europe. We have also a large number of the weedy plants especially of Iowa.

**Seed Collection.**—The seed collection consists of the sets distributed by the United States Department of Agriculture, several German sets of weeds and useful plants, and a large collection of seeds of our common plants, wild and cultivated. The collection is used in studying the adulteration of seeds and the impurity of commercial seeds.

**The Cryptogamic Collection.**—The Cryptogamic Collection comprises a large number of very valuable exsiccati. It contains besides the Ravenel Fungi Americani Exsiccati, a rare collection of dried plants, the now equally rare Ellis' North American Fungi, the Von Thuemen Mycotheca Universalis, besides numerous smaller collections.

**Living Material.**—This department obtains living material from the plants grown by the Department of Agriculture and Horticulture, the grounds of the latter being very rich in lignaceous plants from Europe, Asia and America.

**Course I.**—**Elementary Botany.**—This course embraces a study of the morphology of flowering plants, the terms used in descriptive botany and the determination of simple flowering plants. Leavitt's Lessons and Gray's Manual are used as texts accompanied by lectures and specimens designed to illustrate the subject. The lecture work is supplemented by a thorough laboratory course covering the chief points in elementary botany such as the germination of seed, the different plant members, root and shoot, and the lateral appendages, the leaves, the flower, the fruit and the seed. A brief outline of the vegetable kingdom beginning with the lower forms of plant life, bacteria, algae, mosses and ferns and the minute structure of plants supplemented with the study of the more common flowering plants found in the vicinity of Ames. A collection of fifty specimens of flowering plants is required. Excursions to some convenient point for the purpose of studying the native flora are obligatory. No student will be admitted to the Freshman year who has not given evidence of a good laboratory course of three hours a week for twenty weeks. Academic year, second term; required of students in the Divi-
sion of Agriculture and Division of Science. Recitations and laboratory. Two hours.

Course II.—Ecology.—A course in which the relations of plants to their environment are considered, the relations between insects and flowers, pollination by wind and other agencies. Dissemination of plants by various agencies and the distribution of plants over the earth's surface and factors that influence distribution; plant communities. Excursions are an essential feature of this course. The laboratory course covers the work taken up in the lecture room. The more important fall plants are studied with reference to their pollination. Similar work is done on the dissemination of plants, and also a study of plants with reference to their environments. Required of students in the Divisions of Agriculture, and Science. Recitations and laboratory. Two hours.

Course III.—Histology.—This course is designed as an elementary one. Since students are unfamiliar with the use of the microscope they are taught the use of the same, beginning with very simple objects, such as an air bubble and cotton fibre, then passing on to a study of the cell with its contents, such as starch, protoplasm, nucleus, and crystals. The division of cells and nucleus are studied in light of modern investigations. The laboratory work supplements that of the class-room; the different organs and parts of a plant are taken up, not merely as histological structures but considered from a physiological standpoint. As an illustration, the cuticle, cuticularized and cellulose layers of the epidermal cells of an agave leaf are considered with reference to their significance in preventing transpiration. The absorbing, assimilating, aerating and conducting system are considered in the same way. Lectures, recitations, and laboratory. Required of students in the Division of Science, and in the Division of Agriculture.

Course IV.—Cryptogamic Botany.—The first term of the Sophomore year is devoted to the study of cryptogams from a systematic standpoint. Special attention is given to "rust," "smuts" and "mildews." The morphology and life history of the different groups of cryptogams are considered. Lectures and laboratory, with frequent excursions. Four hours.

Course V.—Vegetable Pathology comes in the first term, Senior year. In this course plant diseases of the farm, garden and horticultural crops are taken up. In this course, lectures on the
more injurious of the fungous diseases of cultivated plants are considered in a more extended way than is possible in the Sophomore year. The theory of immunity and prevention of diseases, rotation of crops and fungicides are considered. In this course the diseases are treated from the standpoint of the host plant. Two or five hours.

COURSE VI. — Advanced Cryptogamic Botany.—This course embraces a study of the more important orders of cryptogams, especially with reference to the flora of Iowa. This course is offered to students in the Division of Agriculture in the Junior year, and the Division of Science in Junior and Senior years. Frequent excursions are obligatory. First term.

Text, Tubeuf, "Diseases of Plants," supplemented by lectures on the algae, fungi and lichens and references to various publications of the experiment stations and reports and bulletins of the United States Department of Agriculture.

COURSE VII. — Bacteriology is an elective study for students in the Science Course, Junior year, but required of the Junior Veterinary, Agricultural and General and Domestic Science students. First and second terms. Required, first term, second year, two years' course Domestic Science. The laboratory work consists in studying some of the common germs and bacteriological technique. In the lectures special attention is given to sanitation and means of preventing contagious diseases. Because of the radical difference in many diseases between man and lower animals the work is taken up in two divisions, one considering its relation to human health and hygiene, and the general subject of making media, sterilization, biology and classification of bacteria; and the other, the diseases of the lower animals. Text, Abbott's Bacteriology and Muir and Ritchie manual is used. Two hours.

COURSE VIII. — Advanced Bacteriology.—This is an elective in the Senior year in which special attention is given to a study of water and micro-organisms. The work is in advance of that done in the Junior year. It is intended especially for persons who intend to enter a professional life either along the lines of sanitary engineering or other professions. Sedgwick, "Principles of Sanitary Science and the Public Health" with special reference to the causation of diseases, Muir and Ritchie, "Manual of Bacteriology" are used. Three hours.
COURSE IX.—Structural Botany.—This course begins in the first term of the Freshman year. The work consists of recitations and lectures. The student is expected to become familiar with the morphology of flowering plants and the terms used in descriptive botany. In the study of identification and selection of drugs it is necessary to have a thorough botanical knowledge of general structural botany as well as vegetable histology. Vegetable drugs not only consist of the entire plant but frequently of only parts. In this course the general structure of the plant from the root to reproductive organs, is taken up and considered. In the laboratory the student takes up the histology of plants especially from the standpoint of pharmacognosy, with a brief survey of the more important plants from a systematic standpoint. Three hours. Two recitations and one laboratory.

COURSE X.—Economic Botany.—In this course special attention is given to a microscopic study of foods. The principal cereals and food plants are studied with reference to their general and minute structure as it gives to the student a general idea of the nature of vegetable foods as well as the reserve material of plants and the systematic position of our economic plants, where they originated and where chiefly cultivated. First term, Junior year. Lectures and laboratory work. Two hours.

COURSE XI.—Vegetable Physiology.—A course of twenty lectures with demonstrations on the functions of plants, nutrition, growth, movements and reproduction of higher plants. Twenty lectures and one laboratory a week. Second term, Senior year. Two or five hours.

COURSE XII.—Vegetable Cytology and Micro-technique.—A study of the cell and its divisions in lower cryptogams and higher plants. The use of reagents and staining, methods of sectioning and mounting. Recitation and laboratory work. Second term, Senior. Three or five hours.

COURSE XIII.—Agrostology.—This course is an elective one. It is intended to give the student a general idea of some of the more important grasses, not only with reference to their botanical position, but also with reference to their economic uses, especially meadow and pasture grasses; the cereal food products, grasses in medicine, grasses as soil binders, and grasses for lawn and lawn making. Lecture and laboratory work. First term, Senior. Two hours.
Course XIV.—*Seeds and Seed Testing.*—A short course embodying the principles of seed testing is given. The principal agricultural weed seeds and their detection in commercial seeds, as well as the structural characters of the more important commercial seeds are studied. The germinative energy of various seed and such other features as are important in connection with seed testing are considered. First term, Senior. Two hours.

Course XV.—*General Systematic Phanerogams.*—This course consists of lectures and laboratory work on the more important orders of flowering plants, especially with reference to the flora of North America. Definite systems of classification, Pre-Linnaean, Linnaean, and post Linnaean. In the laboratory each student is assigned some special group of plants to work up. The synonymy of the species of plants studied by him are looked up. Frequent excursions are obligatory. Second term, Junior. Three or five hours.

Course XVI.—*Poisonous Plants.*—The veterinarian is frequently called on to investigate poisoning. He should therefore be familiar with the plants responsible for poisoning livestock. In this course the subject is treated from the historical standpoint, brief reference to the history of toxicology, auto-intoxication, poisoning from ptomaines, toxines and agents responsible for such poisoning. Poisoning by fungi like toadstools, and ergot. Dwelling on life history of these fungi and the poisons they produce. The rusts and smuts as possible causes of disease. The higher plants are then taken up in a systematic order, calling attention to the poisonous plants in the various orders and means for recognizing these plants. Lectures and laboratory work. Second term, Freshman. Two hours.

Course XVII.—*Advanced Cryptogamic Botany. Ferns.*—A course is offered in advanced cryptogamic botany in which only the vascular cryptogams are taken up. In this course principal attention will be given to the study of the chief types of ferns in this state and in the United States and the general distribution of ferns and their development. The ferns are frequently cultivated and they are objects of interest to every lover of the study of the science of botany. Three hours.

Course XVIII.—*Botanical Seminar.*—There has been organized at the College in connection with botanical work, a Botanical Seminar. Here reviews of recent literature and topics of general interest are considered, each member of the Seminar being as-
signed a topic to report upon. The subjects are then discussed by the members. There are also special lecturers who consider certain topics related to botany. Seminar meets twice a month during the College year. Senior year. One hour each term.

**Course XIX. — Evolution of Plants.** — A course of lectures dealing with evolution as applied to plants, theories of evolution, heredity, origin of plant life, present and past distribution. Senior year. One hour.

**Course XX. — Botanical Micro-chemistry.** — In this work the student becomes familiar with the microscope and its parts; and the structure of cells and the substances contained therein, special attention being given to micro-chemistry. This work covers essentially the work given in Zimmermann's Botanical Micro-technique. Lecture recitations and laboratory work. Second term, Junior. Five hours.

**Course XXI. — Zymotechnique** — In this course special attention is given to the morphology and biology of the micro-organisms of fermentation. Under this head a discussion of the subject of the making of vinegar, lactic acid fermentation, Kephir organisms, the making of bread, slimy fermentations, and butyric acid fermentation. In fact, such subjects of fermentation as are connected with the technical problems of the household and factory. Lectures and laboratory work. Two hours. Text books: Jorgensen's "The Micro-organisms of Fermentation," Conn's "Bacteria, Yeasts, and Molds in the Home," and Conn's "Agricultural Bacteriology."

**DEPARTMENT OF ZOOLOGY**

HENRY F. SUMMERS, PROFESSOR.

JOSEPH E. GUTHRIE, INSTRUCTOR.

C. E. BARTHOLOMEW, ASSISTANT.

**Equipment.** — The laboratory is well supplied with the usual apparatus, including compound and dissecting microscopes, camera-lucidas, microtomes, incubators, paraffin baths, aquaria, etc. In the way of illustrative material, in addition to the general museum and the entomological collections described below, there is a large series of charts, a set of wax embryological models, lantern slides, mounted microscopic slides, disarticulated and articulated skeletons, and alcoholic preparations.

The general museum consists of specimens selected with great care to show the variations of structure found in the
various branches, classes and minor divisions of the animal kingdom. Porifera, coelenterata, vermes, echinodermata, arthropoda, mollusca, and vertebrata are all amply represented by actual specimens and Blaschka glass models. It is especially rich, however, in representative birds and mammals. In addition to a good series of skeletons, there are mounted skins of over four hundred, and eggs of three hundred species of birds and over ninety mounted skins of mammals, the latter including such rare or peculiar forms as the echidna, ornithorhynchus, great kangaroo, kaola, wombat, sloth, great ant-eater, armadillo, manatee, peccary, camel, antelope, bison, Rocky mountain goat and sheep, elk, tapir, porcupine, beaver, fur seal, hedgehog, lemur and monkey.

The collection of insects is very large, embracing about sixty thousand mounted specimens, including a large number of types. It includes the Van Duzee collection of Hemiptera, from Buffalo, New York, including the types of the numerous species described by him. There is also a large series of microscopic forms on slides, and a large amount of material illustrating life histories, especially of injurious insects.

The work in zoology is designed, first, to give a knowledge of those biological laws, together with the data necessary for their thorough comprehension, which is today regarded as an essential part of a liberal education; secondly to furnish the requisite theoretical basis for an intelligent study of certain practical branches of stock breeding, dairying, human and veterinary medicine, and economic entomology, which depend directly upon zoological principles; and, thirdly, to impart a knowledge of the facts and methods of investigation in the last of these practical subjects, namely, economic entomology.

Course I.—Introductory Entomology.—This course is designed as an introduction to all the other work in the Department. Insects are used as convenient forms in giving a training in accurate observation, and in the methods of systematic and field zoology. Some training is also obtained in the use of the microscope. The work begins with a thorough study of the structure of the grasshopper and beetle, followed by the collection of insects and their classification. The life histories of certain selected forms are also traced. The lectures deal chiefly with those facts in the physiology and life history of insects that will best serve as a foundation for a knowledge of the general laws of animal life.
One lecture and one laboratory exercise per week. Second term, Freshman year.

Course II.—Vertebrate Zoology.—A somewhat thorough study of the anatomy of the shark serves as an introduction to the methods of gross dissection. A comparison of the perch with the shark gives an opportunity to impart some knowledge of homology. Following this a similar comparison is made of the anatomy of the Necturus and the frog, including a small amount of elementary histology, which gives some practice in the use of the microscope. A outline of the development of the frog lays a foundation for the more extended study of vertebrate embryology in Course V. This is followed by a briefer study of other types, as amphioxus, lamprey, fish, turtle, bird and mammal. Throughout this course the relation of structure to function is kept constantly in view, the end being to give a conception of each animal as a living being. Three lectures and two laboratory exercises per week in the Science courses and three lectures and one laboratory exercise per week in the Agricultural and Veterinary courses. First term, Sophomore year. Prerequisite, Zoology I.

Course III.—Invertebrate Zoology.—A continuation of the preceding course, devoted to the morphology, physiology, and especially the ecology of selected types of the more important groups of invertebrates, including the amoeba, hydra, earthworm, crawfish, and mussel. Especial attention is devoted to the Protozoa, a very full discussion being given in the lectures of the fundamental forms in which animal functions are exhibited in this group. Questions of phylogeny are quite fully discussed, thus laying a foundation for Course VI. Three lectures and two laboratory exercises per week in the Science courses and three lectures and one laboratory exercise per week in the Agricultural course. Second term, Sophomore year. Prerequisite, Zoology II.

Course IV.—Applied Entomology.—A study of the structure, habits, life-histories and classification of insects with especial reference to economic species; designed to give to Agricultural students, especially those interested in Horticulture, a knowledge of the methods of combating injurious species. The course also serves as a foundation for independent investigation in Applied Entomology. Two lectures and three laboratory exercises per week. First term, Junior year. Prerequisite, Zoology I.

Course V.—Embryology.—The laboratory work is devoted to a study of the development of the frog and of the chick from
preparations made largely by the student, supplemented by others furnished for comparison by the instructor. The methods of making reconstructions from sereal sections may be learned. In the lectures the general principles of development are discussed. beginning with the structure of the germ cells, maturation and fertilization, and tracing the modifications of cleavage and gastrulation found in the different classes of vertebrates. Two lectures and one to three laboratory exercises per week. First term, Junior year. Prerequisite, Zoology II.

**Course VI.**—*Evolution of Animals.*—A discussion of the problems and factors of organic evolution; heredity, variation, origin and distribution of life, etc. One lecture per week. Second term, Senior year. Prerequisites, Zoology II and III.

**Course VII.**—*Comparative Anatomy.*—Advanced work on the comparative anatomy of the chief systems of organs of vertebrates, designed especially to give an understanding of mammalian morphology as derived from that of the lower vertebrates. Second term, Junior year. Three lectures and two laboratory periods per week. Prerequisite, Zoology II, III and V.

**Course VIII.**—*Animal Parasites.*—A course of lectures upon the more injurious parasites of domestic animals. Intended primarily for students of veterinary medicine. Second term, Junior year. Two lectures per week. Prerequisite, Zoology II.

**Course IX.**—*Advanced Entomology.*—Special individual laboratory work in continuation of Course IV, intended for those who expect to engage in the branches of agriculture, as for example horticulture, in which an especially thorough knowledge of insects is necessary, and, for those who expect to pursue entomology as a profession. The exact nature of the work in each case will depend upon the ability and special object of the student. Three to five laboratory exercises per week. First or second term. Junior or Senior year. Prerequisite, Zoology IV.

**Course X.**—*Morphology.*—Special individual work in continuation of Courses II, III, V and VII, designed especially for those who expect to become teachers and investigators in zoology and who are writing their thesis in this department. The work will be given a leaning toward general vertebrate or invertebrate morphology, embryology or taxonomy depending upon the inclination of the student. Three to five hours per week, mainly laboratory. First or second term, Senior year. Prerequisite, Zoology V and VII.
Course XI.—Neurology.—A course in the comparative morphology of the vertebrate nervous system, with especial attention to the physiological anatomy of the human brain. Two lectures and one to three laboratory exercises per week. First term, Senior year. Prerequisite, Zoology II, III and V.

Course XII.—Human Physiology.—A course of lectures, with demonstrations and laboratory work, on the chief functions of the human body, and on the laws of health. The physiology and hygiene proper are preceded by a study of mammalian anatomy, including histology. Two lectures and one laboratory exercise per week. First term, Sophomore year. Five hours. Prerequisite, Chemistry II, V and IX, or XXII, XXIV and IX.

Course XIII.—Human Physiology.—A continuation of Course I. Two lectures and one laboratory exercise per week. Second term, Sophomore year. Five hours. Prerequisite, Physiology I.

Course XIV.—Advanced Human Physiology.—This course consists mainly of a practical laboratory study of the general physiology of nerve and muscle. Two laboratory exercises and one lecture or recitation per week. First term, Junior year. Prerequisite, Zoology XIII.

Course XV.—Advanced Human Physiology.—Work mainly on nutrition. Two laboratory exercises and one lecture or recitation per week. Second term, Junior year. Prerequisite, Zoology XIII.

In addition to the above, special courses will be laid out for students intending to write a thesis in zoology, and also for graduate students in continuation of the lines of work that they pursued as under-graduates. Special facilities will be offered such students for research work. No one will be permitted to write a thesis in this department who has not completed by the end of the Junior year, work in the line in which he wishes to carry on his thesis investigation at least up to and including either Course VII, or Courses III and IX, or Courses XIV and XV.

DEPARTMENT OF GEOLOGY.

Samuel Walker Beyer, Professor
I. A. Williams, Instructor.

The work of the department is carried on by means of recitations, lectures, conferences, laboratory work and numerous field excursions. The student is not only afforded an opportunity to gain some familiarity with the principles and theories discussed
in the leading text-books, but is encouraged to test the theories and verify the principles discussed in the class-room. Field excursions, with carefully written reports thereon are required in all of the courses in Geology.

**EQUIPMENT.**

The Department of Geology shares quarters with the Department of Mining Engineering in Engineering Hall and it is unnecessary to repeat the description of rooms given on a preceding page. The working equipment consists of museum materials, field and laboratory instruments.

The museum contains carefully selected series of fossils, minerals, rock and ores; all available for study purposes. Among the more important collections in Geology and Mineralogy are: The educational series of rocks, collected by the United States Geological Survey; the Smithsonian collection of rocks and minerals; the Rohn, Hodson and Young collections of rocks and ores from the Lake Superior region; the English mineral collection, containing 200 specimens and about 150 species; the Baltimore series of more than 200 specimens of rocks and minerals typical of the petrographic province of Baltimore; the Cushing collection from Clinton County, New York; and a considerable amount of material to illustrate the physical features of rocks and minerals.

In paleontology, the Calvin collection of paleozoic fossils; a large collection of Coastal Plain fossils, principally from the Cretaceous of New Jersey, the Eocene of Alabama and Maryland, and the Miocene of Maryland and Virginia; the Permo-Carboniferous series from Kansas and Russia; and the coal plants of Iowa, Illinois and Pennsylvania are the most important.

In applied geology the Department possesses comprehensive series of lead and zinc ores with their characteristic gangue minerals from Joplin, Missouri, and from the Iowa-Wisconsin area; copper and iron from the Lake Superior region and from the celebrated localities in the Ural Mountains; copper, manganese and silver from Butte, Montana; lead, silver and gold from Colorado, Nevada and California.

Aside from the collections enumerated, Dr. H. Foster Bain, formerly of the Iowa Geological Survey, has kindly loaned to the department his extensive private collection of rocks and minerals; and the Le Grand Quarry Company generously donated a splendid
series of building blocks from their quarries which exhibit the various styles of stone dressing.

The laboratory is supplied with four Bausch and Lomb petrographical microscopes; one Fuess, medium model, latest pattern petrographical microscope. All of the instruments are well supplied with accessories; one Ward mineral dresser, one hand goniometer; one set Preston’s celluloid crystal models; one set Krantz selected wood models exhibiting complicated forms; the Krantz collection of 120 thin sections of the common rock-forming minerals selected and arranged according to Rosenbusch, the collection selected to show the various representative characters of minerals and rocks; one section slicing machine, and complete apparatus for rock separations by heavy solutions; and is supplied with apparatus for doing all kinds of photographic work. A considerable number of instruments for reconnaissance and field work in geology are owned by the Department.

The lecture equipment comprises a Hitchcock’s geological map of the United States; one set of Kiepert’s physical maps; numerous maps and charts of the U. S. Geological Survey and of the Mississippi River Commission and an elaborate series of lantern slides and photographs.

COURSES IN GEOLOGY AND MINERALOGY.

Eight courses are offered in Geology and Mineralogy. Physiography is required in the Divisions of Science and Agriculture; Courses II, IV to VII, inclusive, are required of students in Mining Engineering; Course III is elective to students in Civil Engineering; Course IX is specially adapted to students in the Division of Agriculture, while Courses II to VIII, inclusive, are elective to all students in the Divisions of Agriculture and Science.

Course I.—Physiography.—First term, Freshman, three hours per week; serves as an introduction to the Science of Geology. The first half of the term is devoted to the study of the agents which have to do with modifying the earth’s crust, while the resultant earth features receive careful consideration during the second half of the term. Davis’ or Tarr’s Elements of Physical Geography is the text-book used. Required in the Divisions of Science in the courses in Agronomy and Horticulture of the Division of Agriculture and the two years courses in Mining Engineering and Clay Working.
Course II.—General Geology.—Five hours per week first half year. This course embraces a discussion of the principles which form the groundwork of the science. The first ten weeks are devoted to dynamic and structural geology and the last six to stratigraphic and historical geology. The student is required to make several excursions to points of geological interest to verify the more salient facts discussed in the class room.

Prerequisites.—The elementary courses in physics, chemistry and zoology. Required of students in Mining Engineering; elective in the divisions of Agriculture and Science.

Course III.—Engineering Geology.—The term is devoted to a discussion of the fundamental principles of dynamical and structural geology, and a study of the common minerals and rocks, especially those important in structural materials. The course is given in the second semester and counts four hours per week. Prerequisites the same as for Course II.

Course IV.—Advanced Geology.—Five hours per week, second term, Senior year. The nature, mode of occurrence and origin of the minerals and rocks which constitute the earth's crust are considered in some detail during the first half of the term, while rock alteration as involved in metamorphism and weathering receives special attention during the second half. Excursions are continued as in II, and students are encouraged to familiarize themselves with the methods employed in doing research work and to make independent observations.

Prerequisites.—Course II. Open to students in the divisions of Agriculture and Science.

Course V.—Economic Geology.—Three hours per week, second term, Senior year. This course embraces a discussion of the general features and formation of ore bodies, followed by a description of the distribution and the occurrence of coal and the more important hydro-carbons, building stones, potable waters, salines and other products of economic importance.

Prerequisites.—Courses II, VI and VII. Required of students in Mining Engineering.

Course VI.—Mineralogy.—Two hours class room and one hour laboratory, second half, Junior year. This course is intended to give the student a clear idea of the morphological and physical properties of crystalline substances.
Prerequisites.—Elementary courses in physics, chemistry and mathematics. Required in the Mining Engineering course, and optional in the Division of Science.

Course VII.—Descriptive and Determinative Mineralogy.—Two hours' class room and one hour laboratory in the first term, Senior year. This term's work is devoted to the study of the more important mineral species, their properties, uses, distribution and methods of determination. Required in the Mining Engineering course and elective in the Division of Science.

Course VIII.—Petrography.—Two hours per week during the second term, Senior year, and is essentially a laboratory course. It embraces a short course in the microscopic study of rocks.

Prerequisites.—Courses VI and VII. Required of students in the Mining Engineering course.

Course IX.—Agricultural Geology.—Open to students in the Division of Agriculture, second term, Sophomore year, and counts three hours. The origin, mineralogy and physiography of soils with attendant problems are treated as fully as the time will permit.

DEPARTMENT OF ECONOMIC SCIENCE.

EDGAR WILLIAM STANTON, PROFESSOR.

MR. HIBBARD, INSTRUCTOR.

It is the aim and purpose of this department to train the student to observe and study the general facts of industry; economic theory being presented as the formulated truths of industrial life.

Course I.—Outlines of Economics.—Two text books are used. Ely's "Outlines of Economics" and Cheyney's "Introduction to the Social and Industrial History of England." These are supplemented by lectures and class reports on topics of special importance, such as: the use of gold and silver as money in the United States; the history of the greenback; co-operative movements; labor organizations; and, near the close of the term, the development of the leading industries in the United States is sketched in a series of ten or twelve lectures. Required of Mechanical and Electrical Engineers; elective for Science, General and Domestic Science, and Agricultural students. Five hours per week. First term, Junior year. The course is repeated in the second term and required of Juniors in Civil Engineering.

Course II.—History of Political Economy.—Elective for Juniors or Seniors who have taken Course I. The development of
economic thought, and incidentally economic life, are traced historically from ancient times to the present, special emphasis being given to the period from the Physiocrats to John Stuart Mill. This is a lecture course, supplemented by assigned topics. Twice a week. First term.

COURSE III.—Economic Problems.—Elective for Seniors who have had Course I. Several weeks are spent in a study of trusts and monopolies by means of lectures and class reports. During the latter part of the term a careful study is made of socialism and kindred topics, using as a text Ely's "Socialism and Social Reform," supplemented by references to other authoritative treatises, such as, "Contemporary Socialism," Rae; "History of Socialism," Kirkup; "Quintessence of Socialism," Schaefke. Three hours per week. First term.

COURSE IV.—Money and Banking.—Elective for those who have had Course I. White's "Money and Banking" used as a text. An attempt is made to give a clear understanding of the leading principles underlying the subject, and to familiarize the student with as many of the facts of money and banking in the leading nations as the brief time allotted will permit. Two hours per week. Second term.

COURSE V.—Finance.—Elective for those who have had Course I. The science of finance is recognized as one of the leading branches of economics, and must be studied by one who would understand the functions of the state. Taxation is given special prominence. Adams' "Science of Finance" is used as the basis of this course, with references and comparisons to Ely's "Taxation in American States and Cities," Cohn's "Science of Finance," works by Seligman, etc. Three hours per week. Second term.

COURSE VI.—Industrial History of the United States.—This course is conducted largely on the plan of a seminar. There being no available text the work is done by assigning topics for class reports. Elective for those who have had Course I. Two hours per week. Second term.

DEPARTMENT OF DOMESTIC SCIENCE.

MRS. ALICE PARKS, ACTING PROFESSOR.
MISS WILLIAMS, MISS MORRISON AND
MRS. VAN ZILE, ASSISTANTS.

The widespread interest in Domestic Economy springs largely from the increasing attention accorded to all social prob-
lems. The importance of the home as a social factor is paramount; and the application of science and of the scientific method to household management is coming to be regarded as a necessity. It is not surprising therefore that the study of the home, its function, its administration, its sanitary conditions, the preparation of foods, and a score of kindred topics should find place in the courses of instruction in colleges and universities. The study of Domestic Economy is profitable not only because of its practical worth, but because of its educative value. Many sciences find direct application in the operations of housekeeping; it is consequently the aim of this Department to present this home-study in such a way as to apply the knowledge gained in related and associated sciences. This study seeks at every point the health, convenience and comfort of the members of the household, and by its utility to add to the value of the well kept home.

Domestic Economy Hall adjoins Margaret Hall and includes the general office, the sewing-room, fitting-room, bed-room, laboratory kitchen, dining-room, and store-rooms, all conveniently furnished and equipped for recitations and for demonstrations and practice work.

The methods of instruction embrace the lecture system, textbook study, laboratory practice, demonstration lessons, class discussions, presentation of topics on assigned subjects by individual members of the class, and expeditions for observation and criticism. By a judicious combining of theory and practice, the student gains a thorough understanding of the underlying principles of Domestic Economy and at the same time acquires skill and deftness in execution. Upon completing a systematic course in this Department a young woman is prepared to conduct her home successfully and with that ease which comes only through knowledge and experience.

The work offered in Domestic Economy does not constitute a special and separate course of study, but is one of the several lines included in the general College course for all women students and subject to the usual regulations concerning entrance requirements, classification, examinations and class records.

Materials, tools and utensils for the laboratory work are furnished by the Department, and for the use of these, students pay in Sewing a fee of one dollar each term; and in Cooking three dollars each term.
Four hours each week are devoted to recitation and practice in each of the several subjects included in Domestic Economy, one of which subjects is offered each term of the four years.

DOMESTIC SCIENCE.

Course II.—Foods.—This course familiarizes the student with the processes of cooking and with the principles underlying the cooking of proteids, carbohydrates and fats. The various food stuffs are taken up in the order of their simplicity of preparation. The pupil prepares many nourishing and appetizing dishes, and is trained at the same time in the points of accuracy, order and economy and in the general care of the kitchen and its utensils.

The lectures in this Course deal with the various foods prepared in the laboratory and cover the following general topics: Chemical composition, nutritive value, function in the body, digestibility and cost. In connection with this a study is made of the most wholesome and scientific method of preparing the food under discussion. Freshman year, second term. Two hours.

Course III.—Home Sanitation—Serving.—The special feature of this course is the combining and serving of foods. In connection with cooking, instruction and practice are given in marketing, carving, in the care of the dining room and its furnishings, in table setting and serving. From time to time breakfasts, luncheons and dinners are planned, prepared and served by the pupils.

The lectures of this course deal with Home Sanitation. They treat of the site, surroundings and construction of the house; its plumbing, heating, lighting and ventilation. Sophomore year, first term. Two hours.

Course V.—Foods, Advanced Course. — In the Junior year opportunity is given for added practice in cooking. The foods which are taken up in this term's work require more elaborate preparation than is allowed in the time of the earlier courses, and include roasts, bread and rolls, sauces, salads, desserts and frozen foods, also canning and preserving. The specific foods prepared are determined by the need and desire of the students.

One hour a week is given to a study of food materials, which are considered in greater detail than is possible in the preceding terms. A study is made of Milk, Butter and Cheese, Eggs, Meat, Fish, Vegetables, Bread, Fruit, Food Accessories and Beverages. Junior year, first term. Two hours.
**Course VII.**—*Home Nursing; Laundering.*—The last term's work in Domestic Science is devoted to Home Nursing and Laundering. The work in Home Nursing is presented through lectures illustrated by practical demonstrations. This work is conducted by a trained nurse. Some time is given to invalid cookery and this in connection with the training in nursing enables the young women to become intelligent nurses in their own homes.

The course in Laundering comprises both the theoretical and practical sides. A study is made of cleansing processes, treatment of stains and practical laundering methods. In addition to these subjects the lectures in this course deal with the following topics: The organization of the household, expenditures, a study of family budgets, domestic service, pecuniary economy of foods, and dietaries. Senior year, second term. Two hours.

Research work in home sanitation, physiology, and chemistry of foods, practical dietetics, cooking and other household arts are carried on in connection with the Departments of Chemistry, Botany, and other Sciences.

**DOMESTIC ART.**

**Course I.**—*Plain Sewing.*—The first term's work in Domestic Art gives the student a practical knowledge of all varieties of stitches in hand sewing. Each pupil makes for herself a set of models, including the various stitches, seams, hems, fastenings, plackets, gussets, also patching, darning, lace and embroidery matching and glove mending. Lectures are given upon the use of each model, and a study is made of the various fibers, their growth and process of manufacture. Freshman year, First term. Two hours.

**Course IV.**—*Garment Work* —The work in garment making is open to young women who have completed the course in Plain Sewing. Each student selects materials for underwear, and plans, cuts, fits and finishes the underwear for herself under the supervision of the instructor. The lecture work is a continuation of Course I, and deals with the manufacture of fabrics and the evolution of textile machinery. The history of tapestry and rug manufacture is taken up, with the making of miniature looms of early design by the students, and the manufacture of rugs. Sophomore year, Spring term. Two hours.
COURSE VI.—Drafting and Dress-Making.—This Course furnishes knowledge of the principles of dress-making, with as much practice in their application as time permits. The student purchases, designs, drafts, and makes for herself an unlined cotton dress. This course includes also instruction in making hats, the principles of trimming; knowledge of materials; lace joining; wiring, and preparing materials for trimming; simple hats and bows, making of hat frames, covering and trimming the same. The lectures of this course consider clothing from the artistic, hygienic and philosophic standpoints. The properties and values of textile materials are studied and in connection with this the work of the Consumers' League and Sweat Shops. Junior year, Second term. Two hours.

COURSE VII.—Drafting and Dress-Making.—Continuation of Course VI. Each young woman designs, drafts and makes for herself a lined woolen dress. Instruction is offered in Raffia work, Woven and Sewed Basketry. In this course the lectures treat of Historic Costume. Senior year, First term. Two hours.

COURSE IX.—Theory and Practice of Teaching Domestic Economy.—This course considers methods of teaching Domestic Science and Art in schools of all grades. It includes the planning of courses and the making out of lesson plans and presenting of lessons. The practical work consists of observations and teaching in practice classes; the planning and cost of laboratory equipment. Demonstrations are also given by the students. First term. Two hours.

COURSE X.—Continuation of Course IX. Second term. Four hours.

COURSE XII.—Continuation of Course XI. Senior year, second term. Two hours.

DEPARTMENT OF PSYCHOLOGY.

ORANGE HOWARD CESSNA, PROFESSOR.

COURSE I.—Psychology.—An optional course of elements and outlines of Psychology is afforded the first term of the Senior year to the students of all the College courses. A standard text is used and supplemented by lectures and laboratory work.

COURSE II.—Ethics.—An optional course in Ethics is afforded the second term of the Senior year to the students of all the college courses. Several standard text-books of Ethics are employed
and supplemented by library work and lectures. All callings and pursuits of life are based upon some element of moral obligation. It is the purpose of this instruction in Ethics to give the student a comprehensive acquaintance with the principles and the duties of a faithful life and good citizenship.

**Course III. — Educational Psychology.** — The aim of this Course is to make a study of the elements of psychology and the laws of mental development which underlie the educational processes. There will be a study of the adolescent period with a view to understanding the psychological laws which direct to rational methods of instruction.

Lectures, text-book and class exercises with library work. Three hours per week, first semester, second year of the two years' course in Domestic Science.

**Course IV. — Educational History and Method.** — This course gives an outline of the history of education and also treats of the general methods of teaching as derived from the forms of the mind's activity. It aims to give an insight into those laws which control the individual as a social being. Three hours per week. Second semester, second year of the two years' course in Domestic Science. Text-book, lectures and library work.

**DEPARTMENT OF LITERATURE AND RHETORIC.**

**ALVIN R. NOBLE, PROFESSOR**  
MISS LARRABEE, MISS MACLEAN, ASSISTANT PROFESSORS.  
MISS RFED, MISS MILLER, MISS HOYT,  
MISS WHITE, MISS ABEL, INSTRUCTORS.

In the courses in English two ends are sought, utility and culture. Utility predominates in the first years and culture in the last, though there is hardly a recitation but contains something of both.

So long as man communicates his thoughts and feelings to his fellows, so long will language have a practical value. The man who speaks in a bungling manner, only half succeeds in communicating his thoughts to others. If they catch his real meaning they do it by a happy inference of their own as to what he meant to say. But no man can afford — certainly no college man can afford — to depend on others to correct his own faulty speech. If he uses a wrong word, arranges the parts of the sentence improperly, gives some part an undue emphasis, or fails to indicate
clearly the bearing of one sentence upon another, his language does not truly present his thought, and the world may profit little from his attempt to state it. The more valuable his thought, the greater his need for a clear and effective use of language.

If the student has mastered grammar and rhetoric, that is if he has been trained to apply the principles gone over, his speech should be free from errors and inaccuracies of expression. More than this: if he has been directed to the study of good models, if he has been taught not merely to correct what is faulty, but also—and this is far more important—to appreciate what is excellent in diction, in sentence structure, in the development of paragraphs and of whole compositions—if he has been made to feel the increased utility, the beauty, and the power of language as used by the masters of expression, he will not be content to use language that has only the negative merit of being without faults, but will press on to attain a style enriched by the presence of real excellence, a positive quality. Such language is not simply clear and accurate, it is pleasing and powerful; and the man who has acquired such skill in the use of language has greatly increased his influence in the world. If he can give his valuable thought an adequate expression, his fellows will learn the thought from him, and give him honor accordingly; if he cannot, they will learn it from one who can state it more clearly or more attractively, and the reward is quite as likely to go to the man who best states the thought as to the one who first discovers it.

The courses in grammar, rhetoric, and composition are devoted primarily to this utilitarian end. The facts and principles of language are studied, not as valuable in themselves, but as useful when applied in spoken or written discourse. To this end the student is required to write much, always with some definite object to be accomplished, and usually with some good model before him to inspire him to more earnest effort. When once he has learned to draw from his reading suggestions that will be helpful in his future compositions, he has found a possible utility in everything he studies as literature and has opened the door to continual improvement. Moreover, in learning to appreciate what is best in the models set before him, he gains insensibly something of culture as well as of utility.

The course in debating is designed as a training toward
the effective discussion of live topics. Wherever he goes the college graduate is expected to have opinions of his own on the topics of the day, to be able to state them clearly and forcibly, and, if need be, to defend them. To this end he should train himself to close analysis of complex problems, to a severe testing of every conclusion, his own as well as other people's. Moreover, the public will not wait for him to retire to his study for labored preparation. They expect him to be ready when the occasion calls, and they have generous rewards for the man who is ready—ready to map out a clear-cut line of argument, ready to support it with proofs, and able to present it clearly and forcibly in off-hand discussion. Such readiness comes only from long-continued right-thinking and clear-speaking. It is the aim of this course to start the student toward this goal.

In the courses in literature it is probably true that the culture side predominates, yet utility is seldom lacking. The study of literature calls for close observation, correct inference, fine discrimination. When the mind is trained to do such work, it acquires a power that abides, a power that can be applied to any task. Literature deals with the whole range of human experience, emotion, activity. In studying literature, therefore, we are required to give some study to the mind and heart of man. If such study does not exert an elevating influence, it can only be because the reader does not choose the best, or does not approach the work in the right spirit. At the very least, it ought to give him a deeper insight into human nature, and that is no small gain. But literature is also an art, an art that engages the attention of more people, and holds that attention for a longer time, than does any other art. In studying it, therefore, we are cultivating the aesthetic sense, a part of our nature not appealed to by most studies. Best of all, perhaps, it brings us into the company of the rarest minds of all times; it gives command of the best thought of the best minds; it brings to us the "blessed companionship of wise thoughts and right feelings." It broadens the mind, quickens the imagination, enlarges the sympathies, enriches the whole nature.

COURSES IN ENGLISH.

ACADEMIC YEAR.

Course I.—Grammar.—Syntax of good modern prose; copious analysis, with emphasis on phrases and clauses as structural
units of the sentence, and careful study as to their proper position and connection; daily drill in sentence construction, the application of what the student has learned from sentence analysis; study of the principles of punctuation, with drill in applying them; correction of errors in grammar. Study of language direct, with as little use of text-book as circumstances will permit. Designed to give that ready command of the sentence that shall leave the student free to seek excellence of structure without needing to give conscious thought to correctness. For admission to this course students must pass an examination on the eight parts of speech, their subdivisions, inflections, and properties, or else present a teacher's certificate or a satisfactory grade in a good high school. All courses. Belongs properly to the fall term, but is given in the spring term also. Five hours.

Course II.—Elementary Rhetoric and Composition.—Devoted largely to the study of the paragraph, with Scott and Denney's "Composition-Rhetoric" as text-book. Careful analysis of good models, followed by compositions designed to apply the methods just analyzed. An essay once a week, with exercises almost daily; each student to correct the mistakes he has made. Prerequisite, English I, taken in class or by examination, or diploma from a partly accredited high school. If a student's essays show need of further drill in grammar or punctuation, he will be required to make up the deficiency. Belongs properly in the spring term, but is given in the fall term also. Five hours.

Course A.—Review of Grammar and Elementary Composition and Rhetoric.—A combination of Courses I and II. Designed for high school graduates and others who show the need of a review in these subjects. All courses. Both terms. Five hours.

FRESHMAN YEAR.

Course III.—Advanced Rhetoric and Composition.—Devoted mainly to the planning of essays and the principles involved in the different forms of discourse. An essay once a week, with frequent exercises in diction and in making plans and outlines. Analysis of good prose models. Prerequisite, English II, taken in class or by examination, or diploma from a fully accredited high school. If a student's essays show imperfect preparation, he will be required to make up the deficiency. Required in all the four-year courses. Both terms. Five hours.
COURSE IV.—Composition.—Weekly themes in narration and description, based on models read and discussed before the class. Prerequisite, English III. Required in all the four year courses. Spring term only. One hour.

SOPHOMORE YEAR.

COURSE V.—Composition.—Weekly themes in exposition. Prerequisite, the preceding courses in English. Required in all the four-year courses. Fall term only. One hour.

COURSE VI.—Composition.—Weekly themes and briefs in argumentation. Prerequisite, the preceding courses in English. Required in all the four-year courses. Spring term only. One hour.

The aim of the courses in composition is to train the student to express his thought on whatever subject, not only with clearness and ease but with some degree of grace, attractiveness, and power.

JUNIOR YEAR.

COURSES VII AND VIII.—Debating.—A course in stating and defining questions for debate, in making briefs, and in extemporaneous debating; the application of argumentative principles and methods to live topics. Elective in all courses for students who have completed the preceding courses in English. Course VII in the fall term, Course VIII in the spring term. One hour each.

COURSES IN LITERATURE.

COURSE I.—The English Drama.—Devoted mainly to a study of Shakespeare, with a rapid survey, largely by reports and informal lectures, of the English drama before his time, and a rapid reading of one or two dramas of subsequent time. In Shakespeare three or more plays will be studied carefully and one or two others read rapidly. Character analysis and interpretation, with grouping and contrast. Plot analysis, with stages of complication and resolution. Prerequisites, the courses in English for the Freshman year. A part of Course V, but may be taken independently. Elective in the Agricultural Courses and the Course in the Sciences related to the Industries. Fall term. Three hours.

COURSE II.—Epic and Lyric Poetry.—A course in English poetry, excluding the drama. Selections from Milton, Pope, Coleridge, Wordsworth, Shelley, Keats, Tennyson, and Browning.
Classification of the various forms of poetry. Study of rhythm, meter, rhyme, alliteration, figures of speech, melody, harmony, etc. Principles of criticism applicable to the poems studied. Prerequisites, the courses in English for the Freshman year. Literature I, though not strictly necessary, will yet be of great help. Required in the General and Domestic Science Courses in the Sophomore year; elective in the Agricultural Courses, and in the Course in the Sciences related to the Industries, in the Junior year. Spring term. Five hours.

Course III.—Novel and Romance.—A course in the novel and romance from the eighteenth century to the present time. Differences between the two forms. Comparison to the drama. Plot and character analysis. Outline for systematic study. Prerequisites, the courses in English through the Freshman and Sophomore years; should also be preceded by Course VI, The Short Story. Elective in the Agricultural Courses, the Course in the Sciences related to the Industries, and the Course in General and Domestic Science. Spring term. Junior or Senior year. Three hours.

Course IV.—American Literature.—A study of our best poets and essayists. Comparison with English authors and works. Interrelations of our Literature and History. The prominent writers of the present day. Prerequisites, the courses in English through the Freshman and Sophomore years; should also be preceded by Course II. Elective as before. Fall term. Junior or Senior year. Three hours.

Course V.—The Drama.—A combination of Course I, the English Drama, and Course VIII, the Drama in Translation. Prerequisite, the English courses of the Freshman year. Required in the Courses in General and Domestic Science, in the fall term of the Sophomore year. Five hours.

Course VI.—The Short Story.—A study of the short story from the time of its development as a distinct literary form to the present time. The various types and classes of the short story, with principal attention to the product of the last fifty years in France, England, and the United States. Prerequisites, the English courses through the Freshman and Sophomore years. Should also be preceded by one course in the Drama, either Course I or Course V. Elective in the Courses in Agriculture, in the Course in the Sciences related to the Industries, and in
the Course in General and Domestic Science. Fall term. Junior or Senior year. Two hours.

Course VII.—The Essay.—A course in the leading English essayists, such as Addison, Steele, De Quincey, Macaulay, Carlyle, Ruskin, and Mathew Arnold. Prerequisites, the courses in English of the Freshman and Sophomore years. Elective as before in the Spring term of the Junior or Senior year. Two hours.

Course VIII—The Drama in Translation.—A study of the leading Greek, French, and German dramatists through an English translation. Prerequisites, the English of the Freshman year. A part of Course V, or may be taken independently. Elective in the Agricultural courses and in the Course in the Sciences related to the Industries. Fall term of the Junior or Senior years. Two hours.

DEPARTMENT OF PUBLIC SPEAKING.

ADRIAN M NEWENS, PROFESSOR.

SADIE HOOK, INSTRUCTOR IN ELOCUTION AND PHYSICAL CULTURE

IN GENERAL.

The relation of the department work to the college course is the same as that of any other study. In some courses it is elective, in some years it is required and the credits are given on a basis with every other required or elective study. We aim to equip men and women to speak well, to tell what they know and give their opinions, read and recite in a pleasing and effective manner. All will be called upon at some time to speak publicly, all talk every day, more or less, and for both the more formidable speech and for conversation the work of the department is planned. The subjects which make for perfection along these lines are briefly: emphasis, enunciation, articulation, time, energy, inflection, appreciation, voice culture, physical control, gesture, etc, etc.

Public Speaking has been and still is considered often as a special, peculiar and extraordinary art. There is no denying that it is an art, but first of all it is common sense; common sense applied to speech. The principles which govern conversation to make it dignified, pleasing and forceful may be called Elocution. The mastery of them would make the speaker artistic. These principles are not different when applied to public speech. Public speech is therefore conversation on an enlarged scale.
To reduce Elocution to a system is neither possible, nor desirable. No one system can be made applicable to all persons, as no one style of clothing is appropriate to all classes and conditions of men. There are as many styles of elocution or systems of expression as there are people. Each one possesses an elocution of his own and that should not be taken from him and an inferior one for him be substituted. The development of that power and manner which one possesses already is our aim in the courses of study outlined below.

We grant that all so-called systems have good suggestions. We attempt to use the best of any and all methods, but the student himself is the system and he and his possibility should be respected. The elimination of faults in speech which mar his efforts and the correction of mannerisms that hinder his success are subject to adverse criticism. To stand and think and talk well at one and the same time should be the ambition of every student and man and woman in his chosen occupation.

The theory and practice of Expression,—and speech is more practice than theory,—covers five years of work to those who begin in the academic year, four years to those who begin freshman. However, not all the college courses grant electives in this course with credit, though none are excluded if the proper consent is given. We begin with the first and fundamental work, i.e., How to Read. The interpretation of thought and sentiment is the first desideratum, after that the attention is turned toward physical expression, then on into more formidable recitation and declamation, oratory and extempore speaking.

ORATORY.

Not the least in point of importance in the course of study is that of special attention to the building of an oratorical address or speech. Course VIII has to do with how to write an oration. In that course great orations are studied and analyzed. Their language and plans are observed and a critical and careful scrutiny is given to detail. Winning orations in state and interstate contests are closely observed and the principles which seem to have made them win are emulated. The student writes an oration on a selected subject and delivers it as a part of his work and under the direction of the head of the department. In certain courses still another oration is required in the Senior year.
PRIVATE INSTRUCTION AND LESSONS.

A very limited number of students are admitted under the rules of the college for the purpose of making a professional study of Elocution or Public Speaking. Students in this advance work are advised to finish a college course as a foundation, choose the particular line of work, either teaching the subject or entertaining publicly, and direct their efforts and study to that end. Special tuition is charged for such work. Apply to head of department direct for further information.

COURSES OF STUDY IN ELOCUTION AND ORATORY.

Course I.—Required in first term Academic. All courses. Two hours per week
Lectures on Emphasis, Purpose and kindred subjects. Thought getting and giving, reading and reciting and analysis of selections from literary masterpieces constitute the work of this term.

Course II.—Required in second term Academic Agricultural course, and in second term Freshman, all courses except Engineering and Veterinary. Open to students who have completed Course I or those approved by head of department. One hour per week.
Lectures on physical and vocal expression, gesture and supplementary topics. More formidable recitation and declamation; criticism and coaching the student on the floor.

Course III.—Elective in Junior and Senior years. Open to students who have completed Course II. First term Junior, all courses except Engineering and Veterinary. Two hours per week.
Lectures on Imagination and Literary Interpretation; practical exercises on the floor; papers on assigned topics; Recitation and Declamation; Dramatic Interpretation.

Course IV.—Elective in Junior and Senior years. Open to students who have completed Courses II and III. Second term Junior. All courses except Engineering and Veterinary. Two hours per week.
Lectures on Dramatic Interpretation; Character Impersonation; Oratory and Professional Elocutionary work. Practical work on the platform.

Course V.—Elective in Senior year. Open to students who
have completed Courses II and III. First term Senior, all courses except Engineering and Veterinary. Two hours per week.

Further Dramatic work. Clipping selections from stories and novels. Lectures on Oratory and Orators, Acting and Actors. Scenes and plays studied and acted. Monologues presented.

Course VI.—Elective in Senior year. Open to students having completed a satisfactory amount of previous work. Second term Senior. Two hours per week.

Lectures on Extempore Speaking and practical work in it. Advanced dramatic work and general review.

Course VII.—Required in General and Domestic Science Course for women, Sophomore year. Two hours per week.

Lectures and practical work in aesthetic culture and expression.

Course VIII.—Public Speaking. Required in Second term Junior, all courses except Engineering, Agriculture and Veterinary; elective in Agriculture. One hour per week

Lectures on Orations and how to prepare and write them. The study of speeches and master addresses. The writing and delivery of one production by each student.

Course IX.—Required for First term Senior, all courses except Engineering, Veterinary and Agriculture; elective in Agriculture.

One oration written and delivered under the direction of the head of the department.

Besides these specified courses of instruction in class, numerous special lessons and drill are given in the nature of coaching. Special selections are assigned based on the needs of the student as seen in his classroom work and his defects and strengths are given especial attention. Literary society declamatory and oratorical contest work is cared for by the teaching force of the department, such drill and preparation as each may need for his appearance in the contest are provided gratis.

PHYSICAL CULTURE FOR WOMEN.

SADIE HOOK, INSTRUCTOR.

Training in Physical Culture is required of the young women in the Freshman, Sophomore and Junior years. The work begins the middle of October and ends the first of April. Two
forty-five minute periods each week are required. Aside from the class-work, individual daily practice is insisted upon.

No one system of exercises, but a combination of the best suggestions from several systems, principally those of Anderson, Posse, Emerson, Swoboda and McFadden, are used. The aim throughout is perfect health, which is brought about by the higher physical development. Perfect poise and proper carriage of the body are urged at all times. Attention is called to the effect of this higher development upon the character of the individual; e.g. A well poised erect body is usually indicative of a high moral character.

Indian clubs, dumb bells, suspended bars, rings and exer-cisers are used, but perhaps more attention is given to free hand muscular exercises without the use of apparatus, as such work brings about a certain muscular control and force which soon becomes a part of the individual. One term's work is devoted to correct breathing and breath control. The advanced work is along the line of aesthetics. A few minutes each period throughout the entire work, is given to brisk walking and running steps.

Perfect freedom of the body, unhampered in any way, is always required.

Basket ball and tennis are the out door sports in which the young ladies take an active part.

Course I consists of vigorous exercise with dumb bells, together with many walking and running steps. The bells are discarded the last half of the term and the rigid muscle is used instead.

Course II.—This is a course in breathing and breath control. The mind must become the master of the body. The physiological importance of proper breathing and carriage of the body is emphasized.

Course III.—A few minutes each period are given to the work in Courses I and II. Indian club swinging is the principal work of this term.

Course IV consists of specific exercises for the different parts of the body. These exercises are varied to suit the needs of each individual. Work in the previous course is also given attention.

Courses V and VI.—The third year's work is purely aes-
thetic, for development along the lines of ease and grace of movement. The student is urged to keep up the practice upon the work in the first four courses but the class work consists of fancy steps, drills and free easy movements.

DEPARTMENT OF MODERN LANGUAGES.

LIZZIE MAY ALLIS, PROFESSOR.

MISS NORTON, MISS LUCAS, MR. PETERSON, ASSISTANTS.

The College now offers a two and one-half years' Course in German and two years' Course in French.

Students in all the Engineering Courses take French or German two years.

Freshman French or German for Engineering students is second year work.

French or German is required of Agricultural students in the Freshman year.

In the Academic year of the Course in Science, German is taken, provided the English grammar of the Academic year has been completed.

In the Freshman year of the Course in Science, second year German or first year French is optional.

In the Sophomore year of the same course, for the first term, third year German or second year French is optional.

In the course for women, in the Academic year, German is taken, if English grammar of the Academic year has been completed. German or French is optional in the first two years of the course for Women.

German and French are electives in the Junior and Senior years of the same course.

FRENCH.

Course I.—First Term.—Fraser and Squair's French Grammar is used as text-book for grammatical work, supplemented by conversation and dictation exercises.

Course II.—Second Term.—Grammar continued and translation and study of "L'Abbé Constantin," Halévy.


Course IV.—Fourth Term.—"Les Miserables," Hugo; "Monte-Cristo," Dumas; A Scientific French Reader, Herdler.
COURSE X.—Academic Year. First Term. Engineering Students. Fraser and Squair's "French Grammar" is used as textbook for the grammatical work, supplemented by conversation and dictation exercises. Three times per week.


GERMAN.

COURSE V.—First Term.—Vos's "Essentials of German," including grammar, composition, reading and conversation.

COURSE VI—Second Term.—Vos's "Essentials of German," with continued drill in the principles of declension, conjugation and syntax. Storm's "Immensee."


Courses VIII and IX.—Fourth and Fifth Terms.—"German Science Reader," Gore; Works of Goethe and Schiller, conversation and study of syntax being continued throughout the course.


DEPARTMENT OF HISTORY.

ORANGE HOWARD CESSNA, PROFESSOR

MR C M PERRIN AND MISS MAE MILLER, INSTRUCTORS

Increasing emphasis is rightly placed on the value of the study of history both from the standpoint of general culture and that of usefulness. The men and women who take up the duties of citizenship in this day should have the broadest outlook and come to their tasks with a sympathetic appreciation of what the world has already achieved. No study can have a more practical bearing upon the preparation of the citizen than the evolution of human institutions.
The present day utilitarian view of life may sacrifice the man and the citizen in the interest of the specialist, yet in reality he is the most successful in his specialty, other things being equal, who comes to it with the broadest general preparation.

In view of these facts, the Courses in History aim to give, as far as possible in the limited time allotted, a good general view of the evolution of social, economical and political institutions and the main elements of civilization in general, and to fit the student for intelligently assuming the duties of citizenship.

The student has at his command the large College Library, which contains, besides the principal works of reference, an important section devoted to historical subjects. Quite an addition to the library has been recently made of the new books covering the later phases of historical development.

The text-book in each case is equivalent to about one-half the required work. The remainder is covered by the lectures and library work and thesis preparation.

**COURSES IN HISTORY.**

**Course I.—*Ancient History.***—A general survey of the history of the world to the division of Charlemagne's Empire. Special emphasis is given to the history of Greece and Rome and the events of the earlier Middle Ages. A text-book is used which is supplemented with papers and library work. Five hours per week, first semester of the Academic year of the Science, General and Domestic Science and Agricultural Courses.

**Course II.—*European History.***—A continuation of Course I and treats of the historic movements to the present time. Beginning with the history of the later Middle Ages the aim is to trace the origin and development of the modern states of Europe. The purpose of Courses I and II is to give the student a general view of the principal events in the world's history. The text-book is supplemented by written and library work. Four hours per week, second semester of the Academic year of the Science, General and Domestic Science and Agricultural Courses.

**Course III.—*The Formation of the Union.*—(American History to 1829).** This course is based upon a brief survey of the Colonial period and gives special attention to the early attempts at union and the Constitutional era, also the organization of the government and the significance of territorial expansion and democratic movements to the time of President Jackson. Partic-
ular attention will be given to political, social and economic features. Text-books, Hart's "Formation of the Union," Walker's "The Making of the Nation," and Fiske's "Critical Period," etc. Three hours per week. Lectures and library work. Elective, first semester, Senior year of the Science. General and Domestic Science and Agricultural Courses.

COURSE IV.—Division and Reunion.—(American History from 1829 to the Present). This course is a continuation of Course III. It is a study of the great Middle and Reconstruction Periods of American History. It will treat of the political, constitutional, social and economic movements leading up to, and also growing out of the Civil War. Elective, three hours per week. Second semester of the Senior year of the Science, General and Domestic Science and Agricultural Courses. Lectures and library work. Text-books, Wilson's "Division and Reunion," Burgess' "The Middle Period" and "Reconstruction and the Constitution," etc.

COURSE V.—Europe in the 16th, 17th and 18th Centuries.—This course aims to give a careful study to historic development during these important centuries. The principal topics treated are: The Reformation, the struggle for constitutional liberty in England, the ascendancy of France, the rise of Prussia and Russia and England's colonial supremacy. Attention is given to the social, economic and literary features as well as the political movements of the period. Lectures and library work. Three hours per week, elective second semester, Junior year of the Science and Agricultural Courses. Required in either the First Semester, Sophomore year of the course in General and Domestic Science.

COURSE VI.—The French Revolution and the XIXth Century.—This course is a study of causes and results of the French Revolution, the Napoleonic Era, the reactions and revolutions of the XIXth century to the close of the Franco-Prussian war. Attention will be given to the institutional changes touching the political, social and economic aspects of the movements. Three hours per week. Text-book, lectures and library work. Required Second semester, Junior year of the General and Domestic Science Course. Elective in the Science and Agricultural Courses.

COURSE VII.—The XIXth Century (First Half.).—The aim of this Course is to study the causes and significance of the French Revolution; the reactionary movements under Metternich and the Revolutions of 1830 and 1848. Lectures with
library work. Two hours per week, elective, and may be taken in First semester of either the Junior or Senior year of the Engineering Courses.

Course VII.—The XIXth Century. (Last Half.).—Beginning with a brief review of the French Revolution and the events of the early part of the century this course traces the causes and results of the Reconstruction of Europe during the last half of the century. Special attention is given to German and Italian unity; the French Empire and Republic; the Victorian Era in English history and the Eastern Question. Lectures, papers and library work. Elective, two hours per week and may be taken in the second semester of either the Junior or Senior year of the Engineering Courses.

Course IX.—The Far Eastern Question.—This course covers the questions growing out of the later developments in the Far East. It is a study of world movements at the beginning of the new century. It is based on Reinch's "World Politics at the Close of the XIXth Century." Lectures and library work. Two hours per week, Elective second semester, Senior year of the Courses in Science, General and Domestic Science and Agriculture.

Course X.—The Renaissance.—This course is a study of the Renaissance Period. It is a survey of the causes and movements leading to the great intellectual quickening during the latter half of the Middle Ages. It traces the developments of these forces both in Italy and the Northern Countries in their influence upon civilization. It emphasizes the agents and events which contributed most largely to that transformation of Europe which ushers in the Modern Period. Text-book, lectures and library work. Two hours. First semester. Elective. First semester, Junior year of the Science, General and Domestic Science and Agricultural course.

Course XI.—The Constitutional History of England.—This course traces the development of English Political History. It treats of the steps in the growth of Constitutional Government and Anglo-Saxon institutions and their influence upon American ideals. The constitutional aspect of England's History is most interesting and significant. "In no other field of English activity is to be found so clear a revelation of English National Character." This course serves as an introduction to Course III. Text-book, lectures and library work. Elective. Two hours per

Course XII.—Diplomatic History of the United States.—There is an increasing demand for a knowledge of our foreign relations. The great development of the industrial resources of the country and recently acquired territorial possessions have given new interest and importance to inter-national relations of the United States. This course gives at least a survey of the more important of diplomatic transactions of the U. S. Elective in the First semester of the Senior year in the Science, General and Domestic Science and Agricultural Courses.

Course XV.—Ancient and Mediaeval History.—A general survey of the history of the world to the Reformation. Special attention is given to the history of Greece and Rome and the historic movements during the Middle Ages. The text-book is supplemented by library and written work. Four hours per week, first semester of the Academic year of the Engineering Courses.

Course XVI.—Modern History.—This course is a continuation of Course XV and gives in outline the principal historic movements from the Reformation to the present. Courses XV and XVI give a general survey of the history of the world. The text will be supplemented by lectures and library work. Two hours per week, second semester, Academic year of the Engineering Courses.

Course XVII.—Formative Periods in European History.—This course is a study of the principle movements of European history. The aim is to emphasize and unify the principal forces and movements in the evolution of modern democratic institutions. Lectures with written and library work. One hour per week, first semester of the Freshman year of the Engineering and Agricultural Courses.

Course XVIII.—The American Nation.—This course is a survey of the most important steps in the formation of the American Nation. It is a study of the political, intellectual, social and industrial forces which have made the Republic. Lectures with library and written work. One hour per week, second semester of the Freshman year of the Engineering Courses and Agricultural Courses.
Civics as herein used means the science that treats of citizenship and of the relations between citizens and the government; ethics, or the doctrine of duty to society; civil policy, or governmental methods and machinery; law, in its application most directly involving the interests of society; history of civic development and movement, and the structure and the working of the government and the interrelation of states.

While it is planned to give instruction concerning the American government as it now exists, the student will be expected to look forward to the solution of such problems as may confront the people and the government. At the same time such definite and fixed historical information will be expected from each student as will enable him to have a clear understanding of present governmental forms and practices.

No system of human government is perfect. The discussion of defective laws and the nonenforcement of present laws are common topics of conversation in every state and union.

Believing that in a republic where the people are supreme, an education is incomplete, if not a failure, that does not relate itself to the duties and opportunities of citizenship it will be a purpose to point out to the student a reasonable and patriotic duty touching present laws, and to aid him in all possible ways to become a useful, honored, and law abiding member of the civic community, and to give him suitable instruction with regard to public affairs.

The courses are planned to give such knowledge and training as it is believed should be a part of a liberal education.

The courses offered in civics are more or less closely interrelated with those given in the departments of history, and economics, but it is believed that the association will prove in every way helpful to the student.

COURSES IN CIVICS.

Course I.—When deemed advisable to the proper instruction and advancement of students attention will be directed particularly to the following topics: City, county, and state governments; constitutional conventions; constitutions as "Supreme Law"; checks and balances; the presidency; the senate; the house of representatives; general powers of Congress; the judi-
cial system, federal and state; divisions of powers between the Union and the states; comparison with other federal governments; the spoils system and civil service; government of territories and colonies. A text book is used which is supplemented with papers and library work. Two hours per week, first semester of the Academic year of the Engineering Courses.

Course II—Principles of American Government.—A study of the sources and development of the principles of the federal government. In this course the following documents will be studied and analyzed: Magna Charta, the act of Habeas Corpus, the Petition of Right, The Bill of Rights, Colonial Charters, Plans for Union, the Declaration of Independence, Articles of Confederation, the First State Constitutions, and the Constitution of the United States. The American Party system; origin, structure, and administration. Relation between the Federal and State governments will also be studied. As a prerequisite for this course the student must have pursued Course I, or its equivalent. The course calls for individual work and investigation. Library is, in this course, the student's work shop Three hours per week, Elective in the First semester of the Senior year of the Science and General and Domestic Science Courses.

Course III.—The State and Federal Constitutions.—In this course very little attention is given to theories, but careful consideration is given to principles which have been settled judicially or otherwise The student will study: The rise of the American Union; distribution of the powers of government; the powers of Congress; the powers of the legislature; the powers of the federal executive; the powers of the state executive; the judicial department of the federal government; the judicial department of the state government; the government of the territories; the admission of new states; civil rights and their guaranties; political privileges and their protections; protection to persons accused of crime; protection to contract and property; the eminent domain; municipal corporations The text book is supplemented by lectures, papers and library work. Elective, three hours per week in the Second semester of the Senior year of the Science and the General and Domestic Science Courses.

Course IV.—The demand for the more adequate teaching of morals, especially with regard to the making of good citizens has prompted the preparation of this course. Among the subjects discussed are the following: The family and its government; conditions of good citizenship; rights and duties of citizens; the
citizen's duty to the government; abuses and perils of government; improvement of government; the economic duties of citizens; social rights and duties; the great social subjects; the treatment of criminals, paupers and incorrigible children; international duties, or the rights and duties of nation; ideals, or the higher law. Elective, three hours per week in the Second semester of the Senior year of the Domestic Science course.

Course V.—Rural Law.—This course is a discussion of Iowa Laws as related to highways, fences, weeds, water rights, ditching, drainage, live stock, trespassing, etc., and the legal rights, duties and responsibilities of farmers. Elective, one hour per week, Second semester of the Senior year of the Agricultural Course.

DEPARTMENT OF MILITARY SCIENCE AND TACTICS.

JAMES RUSH LINCOLN, PROFESSOR

It is not intended to complete the education of the thorough soldier, but to fit young men for filling intelligently, positions in the State troops as line officers and company instructors. The constant demand for men thus trained emphasizes the value of a thoroughly organized and well sustained military course. The chief advantages derived are the acquisition of a dignified carriage of the person, a gentlemanly deportment and a self-respecting discipline, with habits of neatness, order and punctuality. Opportunities are afforded each cadet for extending the studies in military science, as desired, the College being provided with the necessary arms, accoutrements and outfits for drill and instructions in the infantry, artillery, and signal tactics, for which special classes will be formed. Lectures on military subjects are delivered throughout the course, and regular battalion drill and parade take place each Monday and Wednesday afternoons. All male students of the College, except such as may be excused on account of physical disability by proper authority, are required to become members of the College battalion, and wear the prescribed uniform during military exercises. Students in the Academic year are not required to drill.

Course I.—First Term, Freshman Year.—Two drills each week.

Course II.—Second Term, Freshman Year.—Two drills each week.
Course III.—First Term, Sophomore Year.—Two drills each week and Non-Commissioned Officers’ School of one hour each week; School of the Guides and Guard Duty.

Course IV.—Second Term, Sophomore Year.—Two drills each week, and Non-Commissioned Officers’ School of one hour each week; Drill Regulations and Guard Duty.

Course V.—First Term, Junior Year, and

Course VI.—Second Term, Junior Year.—Two drills each week, and Officers’ School of one hour each week; Drill Regulations, Guard Duty and Army Regulations. Elective in all courses.

Course VII.—First Term, Senior Year, and

Course VIII.—Second Term, Senior Year—Two drills each week and Officers’ School of one hour each week; Service of Security and Information; Military Engineering; Military Law, and Military Hygiene. Elective in all courses.

The Library.

Vina Elethe Clark, Librarian.
Miss Stevens, Assistant.

The College Library numbers about 17,000 volumes, these being standard works of history, biography, engineering, agriculture, natural science, mental and moral philosophy, poetry, general literature and reference. It has been arranged with a view to making it especially valuable as a reference library.

The books are selected by specialists, the heads of departments indicating such works as they wish the library to have bearing upon their respective lines of study.

The library is classified according to the Dewey Decimal System of Classification and the card catalog is in two parts, the Dictionary (author and title) and Classed.

The library receives about 225 periodical publications, literary, scientific and general, and there are complete files of many of these upon the shelves.

The library has on file 4,500 unbound pamphlets, and is in constant receipt of large numbers of pamphlet publications from the various departments of the government, agricultural experiment stations and other sources. The library has also several hundred bound volumes of government publications, such as Geological Surveys, United States Experiment Station Bulletins, Congressional Record, War of Rebellion Record, Census Reports, Cabinet Officers’ Reports, etc.
The reading room of the library is a large, well-lighted room, and is open to readers ten hours daily, except Sundays, when it is open five hours. Current numbers of periodicals are kept in the reading room and are accessible to all, as are newspapers, college exchanges, dictionaries, encyclopaedias, Poole's Index, the card catalogue, etc.

The library subscribes for several Chicago and Iowa dailies, and, through the courtesy of the editors, a large number of the daily and county newspapers of Iowa are sent to the reading room for the use of students.

Personal assistance and suggestions upon all matters relating to the library will be given by the librarian and assistant to all who desire such help.

All students in the Freshman Year in all courses are required to take Library work to the extent of four hours in the fall term.

COURSE I.—Library Work.—Four hours in the First term, Freshman Year.

DEPARTMENT OF MUSIC.
FRANK J. RESLER, DIRECTOR.

The general plan of instruction is similar to that of the best conservatories, and aims to cultivate in the pupil an intelligent appreciation of the noble and beautiful in music. It is designed to lay a sound foundation upon which to build rather than to impart a superficial knowledge for the purpose of display. The branches taught are Piano, Pipe Organ, History of Music, Voice Culture and Sight Singing.

PIANO—COURSE OF INSTRUCTION.

Grade 1—Rudiments of Music, Touch and Technique, Preparatory Exercises by Kohler, Czerny, Duvernoy, etc.

Grade 2.—Touch and Technique. Exercises by Concone, Loeschhorn, Czerny, Heller, etc. Octave studies and easy pieces by good composers.

Grade 3.—Touch and Technique. Sonatas by Haydn and Mozart. Selections from Schubert, Heller, etc.; studies by Plaidy, Czerny, etc.

Grade 4.—Sixty selected studies by Cramer-Buelow, Beethoven's Sonatas. Selected works from Mendelssohn, Weber, Chopin, Rubinstein, Liszt, etc. Daily studies by Tausig.
VOICE CULTURE.

The method of vocal study aims, by graduated exercises and pieces carefully selected, to develop quality of tone, flexibility, power and compass of voice along with correct style and expression in all kinds of songs.

The method aims at ease of production of tones, cultivation of the proper sensation of each tone, correct phrasing, and withdrawal, clean enunciation. Throaty, breathy, palatal and nasal tones are eradicated.

All advanced pupils are admitted free to a large chorus choir, under the leadership of the Director of Music. Only the best works from the great composers are used, and it is believed that the proper rendering of such music is of no little benefit to the musical culture of the earnest student.

The chorus furnishes the music at the Sabbath service and assists in the concerts and public recitals of the department.

Public concerts and recitals are given at frequent intervals during the year; also private recitals weekly, in which all music pupils will be expected to take part.

Students may enter at any time. All tuition and piano rent is payable in advance to the director.

Students may enroll for music alone without additional expense.

EXPENSES.

Tuition for half-hour lessons in each branch:

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<td>For term of forty lessons</td>
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The Department of Music is prepared to furnish practice rooms with piano, light and heat for the following rate: One hour daily for the entire school term, $3.00.

For additional hours the rate per hour will be a little less. All music will be furnished at a discount.
LIST OF STUDENTS
SENIOR HONOR STUDENTS, 1904.

Each of the following has the highest standing in the course represented:

W. C. Bishop, Course in Mechanical Engineering.
R. E. Buchanan, Course in Science.
Gertrude Curtiss, Course in General and Domestic Science.
F. H. Marsh, Course in Civil Engineering.
W. S. Munro, Course in Electrical Engineering.
Wayne Dinsmore, Course in Animal Husbandry.
M. L. Merritt, Course in Horticulture.
L. M. Hurt, Course in Veterinary Science.
Alfred Atkinson, Course in Agronomy.
Fred M. Hansen, Course in Dairying.
Robert Moffett, Course in Mining Engineering.

HONORS IN THE LITERARY CONTESTS

DECLAMATORY CONTEST, SPRING TERM, 1903

Dramatic—Paul Smith, Welsh.
Oratorical—M. L. Bowman, Pythian.

ORATORICAL CONTEST, FALL TERM, 1903

First Prize—H. O. Tellier, Bachelor.
Second Prize—Edna King, Phileleutheroi.
Third Prize—A. Q. Adamson, Philomathean.

INTER-SOCIETY DEBATES, SPRING TERM, 1903

FIRST SECTION

Question: "Resolved, that stocks, bonds, mortgages and other forms of intangible property should be exempt from taxation."


Pythian vs. Bachelor—F. M Hanson, E. S. Guthrie, E. V. Larson, F. F. Hofacre.

SECOND SECTION

Question: "Resolved, that for states where the conditions are similar to those in Iowa, the Michigan system of railway taxation is preferable to the Wisconsin system."
(Winning Society placed first.)

INTER-SOCIETY DEBATES, FALL TERM, 1903

FIRST SECTION

Question: "Resolved, that the adjudication of disputes between employers and employes should be made a part of the administration of justice."

SECOND SECTION

Question: "Resolved, that the Inter-state Commerce Commission should be given power to control railway rates."
Phileleutheroi vs. Philomathean—W. E. Reuling, E. S. Humbert, R. E. Buchanan, C. W. Wagner

INTER-COLLEGIATE DEBATES, 1903

The following students represented the College in the debate with Iowa State Normal School:
M. L. Merritt, Phileleutheroi Literary Society.
R. E. Blackwood, Phileleutheroi Literary Society
F. M. Hanson, Pythian Literary Society.
L. J. Wilkinson (alternate), Crescent Literary Society.
POST GRADUATES

NAME        TOWN        STATE
Bainer, H. M., B. Sc.,  Ames,  Iowa.
Byxbe, F. D., B. Sc.,  Logan,  Utah.
Caine, John T., B. Sc.,  Wabunsee,  Kansas.
Frandson, J. H., B. S. A.,  Buxton,  N. Dak.
Gould, Jas. A., Ph. B. in M. E.,  Houston,  Texas.
Hooper, J. J., B. Sc.,  Ames,  Iowa.
Knight, Addie, B. Sc.,  Ames,  Iowa.
Morrison, Ethelda, B. Sc.,  Ames,  Iowa.
Moore, H. G., D. V M ,  Denmark,  Kansas.
Nielson, Harold T., B. S.,  Detroit,  Michigan.

CANDIDATES FOR DEGREES IN JUNE, 1904.

Agronomy Course.
For the Degree of Bachelor of Scientific Agriculture.
Atkinson, Alfred,  Parks, P. C.,
Torres, Gonzalo S.,  Sampson, Harry Oscar, B. S.,

Dairy Course.
For the Degree of Bachelor of Scientific Agriculture.
Hansen, Fred M.,  Sheldon, DeLa,
Puberbaugh, S. O.,  Tourgee, Carl Herbert,

Animal Husbandry Course.
For the Degree of Bachelor of Scientific Agriculture.
Crouse, Frank H.,  Leffler, George V.,
Danforth, Harry G.,  Rubel, Chester W.,
Dinsmore, Wayne,  Shaff, J. Ostrander,
Eller, Daniel W.,  Tellier, Herbert L.,
Cray, Charles,  Ulibarri Ricardo B.,
Havenhill, Mark,  Williams, Harold R.
STUDENTS OF THE COLLEGE

Horticulture.

For the Degree of Bachelor of Scientific Agriculture.

Dixon, Clyde Ogden, Howard, Harry,

Merritt, Melvin Leroy, Miller, Albert Arthur,

Veterinary Course.

For the Degree of Doctor of Veterinary Medicine.

Graham, Ralph,

Hurt, Leslie M.,

Matthews, Frederick Greenville,

Rapp, Charles A.

Mechanical Engineering Course.

For the Degree of Bachelor of Mechanical Engineering.

Andrews, Ed V.,

Bishop, Howard F.,

Bishop, Walter C.,

Borsheim, H. Theo. B.,

Burton, Joseph Henry,

Corlette, Glen H.,

Dreherm, Irving A.,

Hamerly, Fred,

Minert, Theodore Ray,

Moody, Leslie C.,

Otis, Webb H.,

Pew, George V.,

Phillips, Paul D.,

Poage, Lucian S.,

Simpson, C. Deane,

Starzinger, Otto, B. S. in E. E.,

Tenny, Edgar L.,

Thomas, Dewitt C.,

Usry, Eldon L.

Civil Engineering Course.

For the Degree of Bachelor of Civil Engineering.

Austin, Roy G.,

Brown, Frank L.,

Brown, O. L.,

Brunnier, Henry J.,

Brunlett, E. H.,

Cotton, Ernest,

Gaylord, Laurence T.,

Gersbach, Edward C.,

Lofstedt, Otis Benjamin,

Luford, Leroy L.,

Macdonald, Thomas Harris,

Marsh, Fred Herbert,

Morris, Lester,

O'Hearn, John L.,

Okey, Frank M.,

Roat, James A.,

Shipman, Charley E.,

Wickham, John,

Wilson, Clinton Bates.

Electrical Engineering Course.

For the Degree of Bachelor of Science in Electrical Engineering.

Alvord, Raymond M.,

Anderson, Isaac

Austin, Harry D.,

Brock, William I.,

Buckley, Arthur R.,

Evans, Arthur Lee,

Hazelton, Park H.,

Holden, Arthur Caryl,

Ireland, William Alfred,

McKinney, Robert F.,

McMillan, Roscoe,

Mereness, Girlt N.,

Mining Engineering Course.

For the Degree of Bachelor of Science in Mining Engineering.

Coffey, Robert Carl, Moffett, Robert Hawk, Knowles, Harry Holmes, Smith, Clyde Wilbur.

Course in Science as Related to the Industries.

For the Degree of Bachelor of Science.

Bartholomew, C. Edgar, Larson, Embert Victor, Bevan, William Alfred, Miller, Oliver H., Buchanan, Robert Earle, Newcom, R. Blanton, Campbell, Claude Vernon, Overholser, Alice C., Garberson, J. Howard, Ross, Ellison L., Jordan, John W., Roup Clarence J., Kingkade, Eva Beatice, Stevens, Edith

General and Domestic Science Course.

For the Degree of Bachelor of Science.

Anderson, Harriett, Mosier, Rachel Lucy, Brown, Nellie Isabelle, Rowe, Louise, Cessna, Ethyl, Slater, Bird, Corlette, Bernice, Starr, Nettie Rose, Curtiss, Gertrude, Taggart, Laura M., Johnson, Pearle A., Terrill, Katherine, King, Edna Laura, Terrill, Katherine

SENIORS

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<td>Story</td>
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Brown, F. L., C. E., Shelby, 
Brown, Nellie, G. & D. S., Calhoun.
Brown, O. L., C. E., Manning.
Brunnett, E. H., C. E., Eagle Grove.
Buchanan, R. E., Sc., Shelby.
Burton, J. H., Sc., Ames.
Campbell, C. V., sc., Ames.
Carey, J. R., A. H., Ames.
Corlette, Bernice, G. & D. S., Ames.
Corlette, Glen, M. E., Ames.
Crouse, F. H., A. H., Dike.
Curtiss, Gertrude, G. & D. S., Nevada.
Danforth, H. G., A. H., Little Cedar.
Dinsmore, Wayne, A. H., Ames.
Dreher, I. A., M. E., Scranton.
Eiler, D. W., A. H., Sioux Rapids.
Galley, J. H., C. E., Des Moines.
Garberson, J. H., Sc., Alta.
Gaylord, L. T., C. E., Grinnell.
Gersbach, E., C. E., Montezuma.
Gillespie, L. R., E. E., Spencer.
Graham, Ralph, Vet., Ames.
Gray, Chas., A. H., Ames.
Hamerly, Fred., M. E., Denmark.
Hansen, F. M., Dairy, Goldfield.
Haselton, Park, E. E., Glidden.
Havenhill, Mark, A. H., Fox.
Holbrook, Bruce, C. E., Onawa.
Holln, A. C., E. E., Cherokee.
Howard, Carlotta, G. & D. S., Ames.
Howard, H. H., Hort., Ames.
Ireland, W. A., E. E., Rolfe.
Johnson, Pearl, G. & D. S., Ames.
King, Edna, G. & D. S., Osceola.
Kingkade, Eva, Sc., Ames.
Larson, E. V., Sc., Story City.
Leffer, G. V., A. H., Hillsboro.
Lewis, O. E., C. E., Montezuma.
Lyford, L. L., C. E., Manly.
MacDonald, T. H., C. E., Montezuma.
Marsh, Herbert, C. E., Ames.
McMillan, Roscoe, E. E., Grundy Center, Benton.
Miller, A. A., Hort., Des Moines, Story.
Miller, O. H., Sc., Ames, Polk.
Moffitt, R. H., Min. Eng., Greeley, Polk.
Moody, L. C., M. E., Corning, Story.
Morris, Lester, C. E., Westchester, Polk.
Monroe, W. S., E. E., Des Moines, Adams.
Newcom, R. B., Sc., Oskaloosa, Polk.
O'Hearn, J. L., C. E., Prescott, Sac.
Okey, F. M., C. E., Ames, Mahaska.
Otis, W. H., M. E., Newton, Story.
Overholser, Alice, Sc., Carroll, Story.
Pielsticker, F. S., E. E., Des Moines, Story.
Puderbaugh, S. O., Dairy, Des Moines, Story.
Rapp, C. A., Vet., Shannon City, Union.
Read, Homer, E. E., Des Moines, Polk.
Ricksher, Wm., E. E., Fairfield, Jefferson.
Ross, E. L., Sc., Sutherland, O'Brien.
Rowat, J. A., C. E., Des Moines, Polk.
Rowe, Louise, G. & D. S., Boone, Boone.
Rubel, C. W., A. H., Ames, Story.
Scott, A. H., E. E., Muscatine, Muscatine.
Scranton, H. L., E. E., Gilmore City, Pocahontas.
Shaff, J. O., A. H., Camanche, Clinton.
Shipman, C. E., C. E., West Liberty, Muscatine.
Simpson, C. D., M. E., Wall Lake, Sac.
Slater, Bird, G. & D. S., Ames, Story.
Smith, C. W., Min. Eng., Ames, Story.
Sperry, A. B., E. E., Grundy Center, Grundy.
Starzinger, Otto, M. E., Des Moines, Polk.
Stevens, Edith, Sc., Boone, Boone.
Sumner, W. D., E. E., Ottumwa, Wapello.
Terrill, Katherine, G. & D. S., Grand Junct'n, Greene.
Tibbets, C. L., E. E., Vinton, Benton.
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Mosher, Agnes, Sc., Sioux Rapids, Buena Vista.
Overholser, Pearl, Sc., Ames, Story.
Page, M. L., M. E., Charles City, Floyd.
Patton, T. J., C. E., Newton, Jasper.
Pendray, E. E., Dairy, Oskaloosa, Story.
Peterson, G. C., E. E., Harlan, Floyd.
Plumley, H., E. E., Rockford, Story.
Prather, C. M., Dairy, Ames, Story.
Prouty, Helen, G. & D. S., Humboldt, Story.
Rasmussen, Fred, Dairy, Jewell, Story.
Read, G. C., E. E., Elberon, Story.
Reese, E. A., E. E., Des Moines, Story.
Reinhott, Chas., Agron., Grinnell, Poweshiek.
Reinhart, M. J., C. E., Anthon, Woodbury.
Reynolds, C. B., C. E., Council Bluffs, Pottawattamie.
Ricker, F. H., M. E., Grinnell, Poweshiek.
Rush, H. S., E. E., Colfax, Story.
Scott, A. B., Min. Eng., Shelby, Story.
Smith, I. R., M. E., Milwaukee, Wisconsin.
Stephens, Lola, Sc., Lohrville, Calhoun.
Stevens, Imogene, G. & D. S., Boone, Calhoun.
Stillwell, J. D., Vet., Ames, Story.
Stinson, R. S., A. H., Marion, Story.
Stouder, K. W., Vet., Newton, Story.
Taylor, F. F., M. E., Algona, Grundy.
Tener, W. A., A. H., Brevard, Kossuth.
Thomas, Elbert, A. H., Green Mountain, North Carolina.
Torres, Gonzalo, Agron., Leon, Story.
Trafton, Frank, Vet., Newton, Mexico.
Truman, W. D., C. E., Iowa Falls, Story.
Van Duzer, Guy, Sc., Ontario, Story.
Warden, M. I., C. E., Melbourne, Monroe.
Wark, R. S., C. E., Adair, Marshall.
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Farnham, R. A.,
Fedson Jennie,
Fish, Don,
Fleming, Roy C.,
Flinders, Ora B.,
Flynn, J. P.,
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Ford, C. H.,
Foster, W. L.,
Fraser, Jessie,
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Golden, R. S.,
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Guilbert, O. E.,
Guthrie, E. S.,
Hanssen, H. M.,
Harris, E. N.,
Hauser, B. B.,
Heberling, C. A.,
Hibbard, Stella,
Hidinger, L. L.,
Higgins, J. F.,
Hitchings, W. S.,
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Perrin, A. C., M. E., Ames, Story.
Perry, Frank, Sc., Ames, Story.
Pettinger, Celestine, G. & D. S., Cumberland, Cass.
Pew, G. V., M. E., Lemars, Plymouth.
           2 yr. G. & D. S., Charles City, Floyd.
Pitts, C. W., Sc., Alton, Sioux.
Pitts, G. S., E. E., Alton, Sioux.
Porter, B. E., A. H., Centerville, Appanoose.
Porter, B. G., A. H., Centerville, Appanoose.
Powell, A. L., A. H., Camanche, Clinton.
Purmort, Virgilla, 2 yr. G. & D. S., Cedar Rapids, Linn.
                    Reading, Chas., E. E., Churdan, Green.
                    Reuling, W. E., M. E., Muscatine, Muscatine.
Richardson, R. W., E. E., Mason City, Cerro Gordo.
Rieke, F. C., A. H., Blairstown, Benton.
Ross, F. R., C. E., Oelwein, Fayette.
Rowat, F. F., E. E., Des Moines, Polk.
Sanford, A. L., E. E., Council Bluffs, Pottawattamie.
Sayre, E. A., Min. E., Perry, Dallas.
Schiele, Arthur, A. H., Blue Grass, Scott.
Schulte, Louise, 2 yr. G. & D. S., McGregor, Clayton.
*Scott, E. E., A. H., Marathon, Buena Vista.
Scott, Roe S., M. E., Glidden, Carroll.
Shaw, Genevieve, G. & D. S., Des Moines, Polk.
Shaw, Winifred, G & D. S., Des Moines, Polk.
Sloane, F. M., C. E., McGregor, Clayton.
Smith, Earl, E. E., Clinton, Clinton.
Smith, Howard, E. E., Nashua, Chickasaw.
Stephenson, R. W., E. E., Seward, Nebraska.
Stewart, G. H., C. E., Packwood, Jefferson.
Stocum, A. P., E. E., Sanborn, O'Brien.
Stoufer, D. B., M. E., Marion, Linn.
Stuart, LeRoy, Hort., West Branch, Cedar.
Sullivan, R. J., A. H., Des Moines, Polk.
Tellier, H. O., A. H., Humboldt, Humboldt.
Thompson, Theo., A. H., Grand Forks, North Dakota.
Tracy, Paul, Min E., Ames, Story.
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STUDENTS OF THE COLLEGE

Bickel, K. D., Sc., McGregor, Clayton.
Biller, Howard, A. H., Cherokee, Cherokee.
Blackburn, Bess, 2 yr. G. & D. S., McGregor, Clayton.
Bliss, G. R., Hort., Corning, Adams.
Bolser, Miles, E. E., LeMars, Plymouth.
Bowen, M. R., Min. Eng., Des Moines, Polk.
Brandt, J. W., C. E., Jewell, Hamilton.
Bridges, E. F., C. E., Oskaloosa, Mahaska.
Broadie, R. W., C. E., Waverly, Bremer.
Brown, C. E., Vet., Prairie City, Jasper.
Brown, E. J., C. E., Sheldon, O'Brien.
Burbridge, H. C., C. E., Manchester, Delaware.
Burke, Tom, M. E., Council Bluffs, Pottawattamie.
Camp, Ruell, Sc., West Union, Fayette.
Carr, H. M., C. E., Algona, Kossuth.
Carsten sen, A. N., E. E., Clinton, Clinton.
Cashman, C. F., A. H., Williamsburg, Iowa.
Chalupnik, J. C., A. H., Traer, 'Tama.
Chapman, Thos, Min. E., Hilton, Monroe.
Christian, H. L., M. E., Des Moines, Polk.
Clark, J. C., M. E., Calmar, Winnebago.
Clark, Floyd, C. E., Waukon, Allamakee.
Clauson, C. C, Min. E., Forest City, Winneshiek.
Claxton, Robt., A. H., Randalla, Hamilton.
Cleghorn, Ruth, G. & D. S., Onawa, Monona.
Clyde, Mary E., 2 yr. G. & D. S., Osage, Mitchell.
Conwell, S. W., C. E., Grand River, Decatur.
Cooper, A R., E. E., Shellsburg, Benton.
Cooper, R. L., C. E., Winterset, Madison.
Corning, Stanley, A. H., Hampton, Franklin.
Corry, F. G., A. H., Yellow Springs, Ohio.
Coutts, R. V., M. E., Grinnell, Poweshiek.
Cozzens, F. S., Vet., Colo, Story.
Crouse, R. W., A. H., Dike, Grundy.
Crum, R. W., C. E., Cedar Rapids, Linn.
Curtiss, C. E., C. E., Redfield, Dallas.
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STUDENTS OF THE COLLEGE

Guernsey, S. C., A. H., Plano,
Guthrie, C. B., Hort., Coin,
Guthrie, G. B., Sc., Winthrop,
Haag, C. H., E. E., Red Oak,
Haefer, Henry, A. H., Charles City,
Hall, A. G., C. E., Moravia,
Hallowell, Ada E., G. & D. S., Dow City,
Harmon, Albert, E. E., Clear Lake,
Carpenter, G. & D. S., Hawarden,
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Hall, A. G., C. E., Stacyville,
Harper, H. M., E. E., Waterloo,
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Healy, C. E., Council Bluffs,
Henderson, C. E., Jewell,
Herr, Gertrude, Sc., Ames,
Hewitt, C. M., E. E., Morning Sun,
Hicks, L. J., E. E., Monticello,
Higgins, F. H., A. H., keswick,
Hinkle, A. J., E. E., Lake City,
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Hook, W. A., A. H., Ames,
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Hunt, J. M., A. H., Ackley,
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Johnson, D. F., E. E., Red Oak,
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Jones, M. F., M. E., Knoxville,
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Kennedy, Nellie, G. & D. S., Coon Rapids,
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Kirkpatrick, Wade, Sci., Hedrick,
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Kupfer, Carl A, C. E., Des Moines,
Appanoose.
Page.
Buchanan.
Montgomery.
Floyd.
Appanoose.
Crawford.
Cerro Gordo.
Sioux.
Carroll.
Mitchell.
Black Hawk.
Colorado.
Mills.
Pottawattamie.
Hamilton.
Story.
Lousiana.
Jones.
Keokuk.
Minnesota.
Story.
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Linn.
Keokuk.
Story.
Taylor.
Story.
Montgomery.
Clay.
Clayton.
Hardin.
Cherokee.
Butler.
Montgomery.
Palo Alto.
Marion.
Delaware.
Wayne.
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Location:
- Carroll
- Keokuk
- Fort Madison
- Meltonville
- Rockford
- Ft. Madison
- Ames
- Waukee
- Scranton
- Pueblo
- Iowa City
- Oklahoma City
- Iowa City
- Oklaoma
- Newton
- Clinton
- Hamilton
- Hamilton
- Newton
- Clinton
- Newton
Melvin, I. E., E. E., St. Lam.
Mehling, Thos. T., M. E., Keokuk.
Miller, Frank G., Vet., Storm Lake.
Miller, G. Fred, E. E., Boone.
Miller, L. C., E. E., Webster City.
Miller, M. A., C. E., Charles City.
Mills, M. A., C. E., Central City.
Moles, R. D., C. E., Central City.
Money, F. B., C. E., Humboldt.
Moles, R. D., A. H., Rensselaer.
Moreno, Ruben J., Vet., LaPlanta.
Moore, Wm., Vet., Cedar Rapids.
Morris, Mrs. Della, C. E., Ames.
Morris, E. L., A. H., Linn Grove.
Morris, F. G., A. H., Ames.
Martin, Earle, E. E., Shelby.
Mosier, Mac, Min. Eng., Des Moines.
Mullen, D. G., Sc., Pomeroy.
Murphy, L. J., Min. Eng., Davenport.
Murray, Buford, E. E., Fairfield.
Neeley, J. B., C. E., Glenwood.
Newcom, Geo. W., M. E., Boyer.
Oakland, Ed, E. E., Blairsburg.
Olson, O A., E. E., Westbrook.
Packard, Walter, A. H., Oak Park.
Packer, Earle, C. E., Bonaparte.
Packer, J. H., A. H., Marshalltown.
Paine, C. E., C. E., Burt.
Paine, Raymond, A. H., Eagle Grove.
Parrish, Maud C., 2 yr. G. & D. S., Ames.
Patzig, M. L., M. E., Des Moines.
Paul, Denton, C. E., Paulina.
Perkins, F. H., C. E., Sheldon.
Pearson, Lee, A. H., Sibley.
Person, Myrtle, G. & D. S., Sibley.
Pettinger, Florence, G. & D.S., Cumberland.
Pierce, Foster, Vet., Denison.
Pimmott, R. W., A. H., Montezuma.
Plitt, John, C. E., Wapello.
Porter, Geo., A. H., Council Bluffs.
Potter, F. M., Min. E., Rockford.
Prior, LaRue, E. E., Marion, Linn.
Quigley, J. H., M. E., McGregor, Clayon.
Remington, B. S., C. E., Neola, Pottawattamie.
Renier, Albert, E. E., Dubuque, Dubuque.
Robb, Luella, Sc., Ames, Story.
Robertson, J. D., M. E., Otumwa, Wapello.
Robertson, R. D., C. E., Council Bluffs, Pottawattamie.
Robinson, A. I., E. E., Stockton, Muscatine.
Robinson, Herbert, E. E., Sloan, Woodbury.
Roby, C. A., C. E., Waterloo, Black Hawk.
Rowell, R. E., E. E., Ruthven, Palo Alto.
Ruedo, Grace Rood, 2 yr. G. & D. S., Anita,
Rundall, Mabel, Sc., Rodman, Cass.
Russell, Claude, C. E., Des Moines, Palo Alto.
Sanders, J. F., Agron., Rudd, Polk.
Scantelbury, E. C., Vet., Hampton, Floyd.
Scherling, Gus, E. E., Parkersburg, Franklin.
Schlegel, Ella, Sc., Boone, Butler.
Schlegel, Mary, Sc., Boone, Boone.
Schnare, F. W., Sc., Davenport, Boone.
Schroeder, W. N., M. E., Rock Island, Scott.
Scott, C. E., Min. Eng., Shelby, Illinois.
Shaw, R. C., Vet., Des Moines, Shelby.
Shaw Van, J. E., C. E., Denison, Polk.
Skelley, F. B., E. E., Lost Nation, Crawford.
Shinkle, I. B., C. E., Webster City, Clinton.
Shotwell, L. W., Min. Eng., Des Moines, Hamilton.
Shrader, W. E., E. E., Des Moines, Polk.
Sieben, I. L., Agron., Geneseo, Polk.
Skinner, B. B., C. E., Osage, Marion.
Skubal, F. V., C. E., Riverside, Mitchell.
Smith, Earl, Dairy, Chickasaw.
Smith, Harry, A. H., Idas.
Smith, Harold, Min. E., Monticello, Jones.
Smith, Seward L., A. H., Marion, Linn.
Smith, T. W., E. E., Monticello, Jones.
Stahl, Chas., E. E., Tiffin, Johnson.
Stanard, C. D., E. E., Walnut, Pottawattamie.
Stange, Chas. H., N. English, Iowa.
Stanton, Edgar W., Jr., Vet., Ames, Cedar.
Stebbins, A. W., M. E., Ellsworth, Story.
Stevenson, C. W., A. H., Port Huron, Story.
Stewart, W. C., Vet., Oelwein, Hamilton.
Steckle, Emery, E. E., Grinnell, Michigan.

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Templeton, E. G., A. H., Ames, Story.
Terrill, Eunice, 2 yr. G. & D. S., N. Providence.
Terrazas, W. T., A. H., Chihuahua, Mexico.
Thompson, A. P., Min. Eng., Ft. Dodge, Webster.
Thompson, A. W., E. E., Davenport, Scott.
Tinsley, Grace, Sc., Ames, Story.
Todnem, O. H., E. E., Humboldt, Humboldt.
Tow, Ed, Vet., Norway, Benton.
Tripp, F. C., A. H., Ruthven, Palo Alto.
Troup, Jas., E. E., Sioux City, Woodbury.
Tunis, F. L., E. E., Manchester, Delaware.
Uhl, W. F., E. E., Mitchellville, polys.
Wachenfeld, S. C., M. E., Orange, New Jersey.
Wallis, R. S., E. E., Ames, Story.
Walters, Blanch, G. & D. S., Ames, Story.
Walters, Howard, E. E., Keokuk, Story.
Walton, Chas., M. E., Paton, Lee.
Walton, J. B., E. E., Webster City, Green.
Warnock, E. S., M. E., Battle Creek, Hamilton.
Wentworth, E. N., A. H., State Center, Pottawattamie.
Wharton, Mazie, Sc., Delta, Ida.
Whittacre, Roy, E. E., West Liberty, Keokuk.
White, Eugene, Min. Eng., West Union, Muscatine.
Whitaker, H., E. E., Marshalltown, Fayette.
White, Fred, C. E., Keosauqua, Marshall.
Whitehead, D. V., C. E., Pipestone, Story.
Williams, J. R., A. H., Postville, Minnesota.
Williams, B. A., E. E., Maitland, Allamakee.
Willits, E. V., A. H., Union, Missouri.
Wilson, E. P., E. E., Bedford, Story.
Wilson, F. W., C. E., Atlantic, Taylor.
Wilson, Platt, C. E., Montezuma, Story.
Wilson, R. R., E. E., Sanborn, Poweshiek.
Winslow, W. W., C. E., Belle Plaine, O'Brien.

Reinbeck, Grundy.
Massena, Cass.
Miles, Jackson.
Ames, Story.

Hardin.
Mexico.
Webster.
Scott.
Lyon.
Story.
Humboldt.
Benton.
Palo Alto.
Washington.
Woodbury.
Delaware.
Page.

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Cass.
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Story.
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Champlin, H. W., A. H., Chariton, Jackson.
Conger, E. H., M. E., Desoto, Delaware.
Cooper, Clifford, E. E., Blairsville, Dallas.
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McKibben, H. B., A.
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Newton, Mae, Sc.
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Schofield, W. J., E. E., Sioux City,
Scott, Floyd, C. E., Strawberry Pt.,
Seger, Ralph, Sc., Ontario,
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Shaw, Ray P., M. E., Grant City,
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Sherriff, H. C., G. & D. S., Tabor,
Shreve, D. M., Sc., Charter Oak,
Shumway, C. R., A. H., Marshalltown,
Smith, Adah, Sc., Gladbrook,
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Smith, F. S., E. E., Riverton,
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Smith, Geo., M. E., Berlin,
Smith, Geo. R., M. E., Ft. Madison,
Smith, H. Steven, Sc., Riverton,
Snow, Zatha, Sc., Blakesburg,
Snyder, D. C., Sc., Center Point,
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Spangler, Julia, Sc., Ames,
Sparks, Mary, Sc., Boone,
Spencer, Frank, E. E., Neola,
Squires, Frank, A. H., Glidden,
Squier, Corona, Sc., Osceola,
St. Clair, H. H., M. E., Vinton,
Stevens, Byrnie, A. H., Arnold's Park,
Stevens, Jno. E., Min. Eng., Boone,
Stickel, H. J., E. E., Bridgewater,
STUDENTS OF THE COLLEGE

Stone, H. W., E. E., Burlington, Des Moines.
Stoner, R. H., A. H., S. English, Keokuk.
Stratton, Frank, E. E., Red Oak.
Strever, Ensign, C. E., Kamrar.
Swanson, M. A., Fremont.
Swisher, J. E., Min. Eng., Carroll.
Taylor, C. G., M. E., Sibley.
Templeton, M. S., Sc., Ames.
Thayer, S., E. E., Rock Valley.
Thomas, Clarence, M. E., New Sharon.
Thompson, Lee, E. E., Tingley.
Tiara, Bessie, G. & D. S., Polk City.
Tiara, F. A., C. E., Polk City.
Treynor, A. M., Min. Eng., Des Moines.
Trullinger, Sam, C. E., Farragut.
Tunnicliff, Harry, M. E., Shenandoah.
Van Gilst, P. C., M. E., Newton.
Van Horn, Melvin, A. H., High'l'd Center.
Vincent, M. S., M. E., Shenandoah.
Waggoner, Matie, Sc., Pringle.
Waggoner, O. E., M. E., Primghar.
Wagner, Chas., C. E., Des Moines.
Wagner, H. W., E. E., Calamus.
Warden, Zella, G. & D. S., Melbourne.
Wartz, O. G., A. H., Russell.
Watts, Thos, A. H., Ames.
Wettstein, Adolph, M. E., Newton.
Whitmore, H. L., C. E., Batavia.
Wieland, Albert, M. E., Gladbrook.
Wilson, Clyde E., C. E., Doon.
Williams, Paul, E. E., Clear Lake.
Wilson, Harriet, Sc., Hedrick.
Wilson, R. R., Min. Eng., Seymour.
Winegar, R. E., A. H., Westgate.
Winkelhaus, L. C., C. E., Clinton.
Woody, A. E., M. E., Newton.
Worstenberg, Otto, M. E., Eldridge.
Young, Chas., C. E., Muscatine.
Zenor, E. J., Hort., Ontario.

SPECIALS.

NAME COURSE TOWN. COUNTY.

Ainsworth, Mary E., G. & D. S., Des Moines, Polk.
Alexander, C. C., A. H., Conrad, Grundy.
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Maxson, Mrs. L. S., G. & D. S.,
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Priem, Edward, Agron.,
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Smith, Claud, A. H., Sioux City, Woodbury.
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Smith, Paul, Sc., Ames, Story.
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Summers, Jno., M. E., Lyons, Clinton.
Vorse, Florence, Agron., Muscatine, Muscatine.
Wagner, E. L., Agron., Des Moines, Polk.
Waller, Pearl, G. & D. S., Charles City, Humboldt.
Wilson, A. R., E. E., Clinton, Ida.
Wilson, D. O., Agron., Hedrick, Clinton.
Wilson, G. K., Agron., Davenport, Keokuk.

NAME.
Bahr, J. C., Preston, Jackson.
Balbus, Bert, Story City, Story.
Blanchard, A. C., New Hampton, Chickasaw.
Brown, J. J., Solon, Johnson.
Caldwell, Bert, Story City, Story.
Campbell, G. W., Ladora, Iowa.
Colburn, N. S., Haverhill, Massachusetts.
Guthrie, Chester, Newton, Jasper.
Hanke, B. B., Camanche, Clinton.
Honstrom, A W., Ogden, Boone.
Jackson, G. R., Ames, Story.
Johnson, C. R., Fontanelle, Adair.
Ladd, Robert, Malvern, Mills.
Larmore, Earl, Sergeant Bluffs, Woodbury.
Langwill, Wm. G., Van Wert, Decatur.
Lockwood, F. F., Rockford, Illinois.

TOWN.

COUNTY.
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Early, Harry, Liscomb, Iowa.
Seward, John M., New Providence, Iowa.
Findlye, Ray, Grimes, Iowa.
Fairley, Will, Mechanicsville, Iowa.
Gleason, G. S., Mechanicsville, Iowa.
Kelsey, C. J., Iowa Falls, Iowa.
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Boland, F. G., Jordan, Iowa.
Haddock, G. W., West Branch, Iowa.
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Wiggins, Frank, Altamont, Kansas.
Thompson, Stanley, Ralston, Iowa.
Tostenson, Omer, Glidden, Iowa.
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White, Geo. T., Le Grand, Iowa.
Fox, Benjamin, Madrid, Iowa.
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<td>Abbott, F. O.</td>
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<td>Guthrie</td>
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<td>Brooks, F. H.</td>
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<td>Wright</td>
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Billings, L. W.,
Balfanz, H. J.,
Cave, W. C.,
Clifton, C. C.,
Dodd, Reuby S.,
Granseth, Alfred,
Gowdey, Lester,
Hammond, W. H.,
Heath, Chas. S.,
Hall, J. C.,
Illiff, B. C.,
Jenn, P. M.,
Jackman, J. R.,
Kleckner, Frank S.,
Koehn, A. J.,
Kernan, M. J.,
Murphy, C. P.,
Odell, F. L.,
Olson, Charlie,
Pollard, W. K.,
Pollard, L. A.,
Romine, Jas.,
Remington, H. D.,
Schuerman, E. L.,
Smarzo, William S.,
Staman, J. A.,
Stallmann, John,
St. John, John C.,
Stolberg, Knud,
Trowbridge, Paul,
Trussel, H. A.,
Thill, F. F.,
Vavrescheck, Frank,
Lester,
Rockwell City,
Waverly,
Maquoketa,
Humboldt,
Bode,
Dexter,
Great Bend,
Rowan,
Wilmington,
West Union,
Dubuque,
Fontanelle,
Lamont,
Ellenboro,
Meservey,
Osakis,
Greenfield,
Burt,
Thorpe,
Thorpe,
Toledo,
Wheaton,
Monona,
Masonville,
Carroll,
Iona,
Waterloo,
Pioneer,
Columbus,
Baxter,
Zurlingle,
Spirit Lake,
Plymouth.
Calhoun.
Bremer.
Jackson.
Humboldt.
Humboldt.
Dallas.
Kansas.
Wright.
Ohio.
Fayette.
Dubuque.
Adair.
Buchanan.
Wisconsin.
Cerro Gordo.
Minnesota.
Adair.
Kossuth.
Delaware.
Delaware.
Tama.
Illinois.
Clayton.
Delaware.
Carroll.
Minnesota.
Black Hawk.
Humboldt.
Wisconsin.
Jasper.
Dubuque.
Dickinson.

MUSIC STUDENTS

NAME.
Anderson, Gurine.
Ashby, H. P.
Ainsworth, Mary.
Anderson, Nora.
Anthony, Horace.
Bateman, Lottie.
Bevington, Edan.
Brandt, Ora.
Miller, Blanche.
Baldwin, Nancy.
Beyer, Mrs Jennie.
Bishop, H. F.,
Bobst, J. A.,
Brunnier, H. J.,
Bailey, R. W.,

TOWN.
Stanhope.
Creston.
Des Moines,

COUNTY.
Hamilton.
Union.
Polk.

Camanche.
Ames.
Ames.
Ames.
Des Moines,
Gladbrook.
Ames.
Ames.
Geneva.
Manning.
Des Moines.
Cessna, Ethyl, Ames,
Cooley, Belle, Ames,
Cole, Robert, Masonville,
Decker, C. W., Charles City,
Dixon, C. O., Stuart,
Dow, H. W., Ames,
Davenport, Laura, Odobolt,
Entwhistle, Edith, Rutland,
Eldredge, Madge, Ames,
Erslund, Bertha, Slater,
Forsbeck, Sadie, Gray,
Forsbeck, Ella, Gray,
Gabrielsen, Carolyn, New Hampton,
Guthrie, Chester, Newton,
Hansen, Harry, Stacyville,
Huff, Bryant, Lake City,
Hofacre, F. F., Monticello,
Hoyt, Beryl, Ames,
Heglend, Olive, Slater,
Johnson, Louis, Ames,
Johnson, Emma, Ames,
Knickerbocker, C. J., Fairfax,
Kimball, Florence, Council Bluffs,
Long, Nell, Ames,
Lofstedt, Bertha, Rippey,
Lawson, Mary, Ellsworth,
Linderman, L. H., Fredericksburg,
Marston, Mrs A., Ames,
Muffley, Mary, Des Moines,
Marvick, Linnie, Ontario,
McKinley, Ethel, St. Ansgar,
Mills, Marcella, Jefferson,
March, Julia, Ames,
McConnell, Clara, Ames,
Morris, Helen, Ames,
Mecka, Ivy, Boone,
Miller, Roy, Estherville,
McCulloch, M. E., Humeston,
Olsan, Julia, Roland,
Olin, Mrs Winnie, Ames,
Parsons, Millie, Ames,
Pettinger, Florence, Cumberland,
Pack, Walter, Ottumwa,
Reed, Helen, Ames,
Robinson, M. H., Harlan,
Stewart, Josephine, Ames,
Stephens, Lola, Johrville,
Storms, Lilian, Ames,
Storms, Laura, Ames,
Snow, Zatha, Blakesburg,
Scott, Ada, Ottumwa,
Sheldon, Mary, Ames,
Tablor, Story.
Ames, Story.
Masonville, Story.
Charles City, Story.
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Smith, Laura,  
Scott, C. R.,  
Shreve, D. M.,  
Smith, F. S.,  
Snavely, W. A.,  
Usry, E. L.,  
Williams, H. R.,  
Wilson, R. R.,  
Welch, G. V.,  
Way, L. D.,  
Zimmerman, Vive,  

Avoca,  
Cambridge,  
Quarter Oak,  
Riverton,  
Tiffin,  
Des Moines,  
Ames,  
Sanborn,  
Des Moines,  
Carson,  
Ames,  
Pottawattamie.  
Story.  
Crawford.  
Fremont.  
Johnson.  
Polk.  
Story.  
O'Brien.  
Polk.  
Pottawattamie.  
Story
LIST OF GRADUATES
ALUMNI OF THE IOWA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

GRADUATES OF 1872.

J. C. Arthur, B. Sc., D. S. LaFayette, Indiana.
*P. S. Brown, B. Sc.
*S. A. Churchill, B. Sc.
*S. H. Dickey, B. Sc.
Charles N. Dietz, B. Sc., Omaha, Nebraska.
Luther Foster, B. Sc., M. S. A., Masilla Park, Las Cruces, N. M.
*H. Fuller, B. Sc.
*F. L. Harvey, B. Sc., M. Sc.
*E. M. Hungerford, B. Sc.
Mattie (Locke) Macomber, B. Sc., 3020 Kingman Avenue, Des Moines, Iowa.
J. K. Macomber, B. Sc., 510 Yongerman Block, Des Moines, Iowa.
L. W. Noyes, B. Sc., 234 Lincoln Park Blvd., Chicago, Illinois.
H. L. Page, B. Sc., 810 Seventeenth Street, Sioux City, Iowa.
G. W. Ramsey, B. Sc., Masonville, Iowa.
*Fannie (Richards) Stanley, B. Sc.
*C. A. Smith, B Sc
*I. W Smith, B. Sc.
H. C. Spencer, B. Sc., Grinnell, Iowa.
J. L. Stevens, B. Sc., 728 Linn Street, Boone, Iowa.
C. L. Suksdorf, B. Sc., 1335 Franklin Street, Davenport, Iowa.
*T. L. Thompson, B. Sc.
C. H. Tillotson, B. Sc., Ormund, Nebraska.
*C. P. Welman, B. Sc.
J. M. Wells, B. Sc., Nevada, Iowa.

GRADUATES OF 1873.

E. L. Beard, B. Sc., Rural Route, No. 5, Decorah, Iowa.
Rowena F. (Edson) Stevens, B. Sc., 728 Linn Street, Boone, Iowa.
*G. R. Flower, B. Sc.
W. Green, B. Sc., Horticultural Department, Capital Building, Des Moines, Iowa.
*G. W. Harvey, B. Sc
D. A. Kent, B. Sc., Jewell Junction, Iowa.
Kate (Krater) Starr, B. Sc., Algona, Iowa.
*J. S. Lee, B. Sc.
C. B. Maben, B. Sc., Wealthwood, Minnesota.
M. F. Marshall, B. Sc., Atwood, Kansas.
Hattie E. (Raybourne) Morse, B Sc., 1617 Humboldt Street, Denver, Colorado.
W. O. Robinson, B. Sc., Trenton, Nebraska.
M. Stalker, B. Sc., V. S., M Sc, Ames, Iowa.
Sallie (Stalker) Smith, B. Sc., Ames, Iowa.

*Deceased
LIST OF GRADUATES 855

GRADUATES OF 1874.

Estella (Bebout) Morse, B. Sc., 1302 6th Ave., Des Moines, Iowa.
C. D. Boardman, B. Sc., 1601 Arlington Ave., Des Moines, Iowa
C. E. Clingan, B. Sc., Waterloo, Iowa.
E. R. Clingan, B. Sc., Sioux City, Iowa.
C. E. Clingan, B. Sc., Belt, Montana.
*C. P. Hastings, B. Sc.

J. G. W. Kiesel, B. Sc., 57 Highland Place, Dubuque, Iowa.
M. C. LItteer, B. Sc., Yukon, O. T.
O. P. McCray, B. Sc., 620 Fourth Street, Sioux City, Iowa.
G. E. Marsh, B. Sc., Osage, Iowa.
Mary A. (Palmer) Snell, B. Sc., Boone, Iowa.
A. A. Parsons, B. Sc., 326 Nevada Ave., Colorado Springs, Colorado
Eva E. (Paul) Vanslyke, B. Sc., 1406 10th St., Des Moines, Iowa.
E. A. Pyne, B. Sc., Waverly, Iowa.
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W. R. Smith, B. Sc., 1629 North 70th Avenue, Chicago, Illinois.
Kate (Tupper) Galpin, B. Sc., 515 S. Fremont Avenue, Los Angeles, California.

GRADUATES OF 1875.

E. P. Cadwell, B. Sc., Manila, P. I.
Milla (Cherrie) Whiting, B. Sc., 636 E. 30 Ave., Denver, Colorado.
Alice (Cunningham) Culver, B. Sc., Knoxville, Iowa.
Lizzie N. (Curtis) Foster, B. Sc., Las Cruces, N. M.
R. P. Kelley, B. Sc., Helena, Montana.
C. H. Lee, B. Sc., 411 McPhee Block, Denver, Colorado.
W. R. Lamoreaux, B. Sc., Los Angeles, California.
Hannah (Lyman) Cadwell, B. Sc., Helena, Montana.
F. J. Macomber, B. Sc., Lewis, Iowa.
Celestia (Neal) Gearhart, B. Sc., 359 7th St., Astoria, Oregon.
T. L. Palmer, B. Sc., Lake Charles, Louisiana.
C. E. Peterson, B. Sc., Panora, Iowa.
*Ida (Ross) Boardman, B. Sc.

M. E. Rudolph, B. Sc., Canton, South Dakota.
Ida L. (Sherman) Caulkins, B. Sc., Storm Lake, Iowa.
L. C. Thornton, B. Sc., Pocahontas, Iowa.
Nancy (Wills) Roundy, B. Sc., Hawarden, Iowa.
J. M. Whitaker, B. Sc., Marshalltown, Iowa.

GRADUATES OF 1876.

M. I. Aitkin, B. Sc., Lincoln, Nebraska.
A. P. Barker, B. Sc., Clinton, Iowa.
L. W. Beard, B. Sc., Decorah, Iowa.
A. M. Blodgett, B. Sc., 402 New England Bldg., Kansas City, Kas.

*Deceased.
Julia C. (Blodgett) Hainer, B. Sc., Aurora, Nebraska.
*L. A. Clausen, B. Sc.
J. E. Cobbey, B. Sc., 720 Grant Street, Beatrice, Nebraska.
Winifred (Dudley) Shaw, B. Sc., 1700 4th St., Des Moines, Iowa.
J. J. Fegtly, B. Sc., 943 S. Main St., Kingfisher, Oklahoma Ter.
W. J. Gilmore, B. Sc., Tipton, Iowa.
J. F. Hardin, B. Sc., Eldora, Iowa.
Ellen W. (Harlow) McKinzie, B. Sc., 1a de Mina, City of Mexico.
A. E. Hitchcock, B. Sc., Mitchell, South Dakota.
W. M. James, B. Sc., Meridan, Yucatan.
Ellie L. (Mead) Dissmore, B. Sc., Lakota, North Dakota.
G. A. Gerard, B. Sc., Denver, Colorado.
H. N. Scott, B. Sc., 604 Portland Savings Bank, Portland, Oregon.
A. B. Shaw, B. Sc., 1700 4th St., Des Moines, Iowa.
L. E. Spencer, B. Sc., 5719 Madison Avenue, Chicago, Illinois.
W. W. Woodward, B. Sc., Lincoln, Nebraska.

GRADUATES OF 1877.

Alfaretta (Campbell) Fassett, B. Sc., 1185 Scoville Avenue, Oak Park, Illinois.

Mary C. (Carpenter) Hardin, B. Sc., Eldora, Iowa.
C. C. Colelo, B. Sc., Carroll, Iowa.
Kate S. (Curtis) Mirick, B. Sc., Monticello, Iowa.
J. W. Doxsee, B. Sc., Monticello, Iowa.
Mary (Farwell) Carpenter, Monticello, Iowa.
A. P. Hargrave, B. Sc., Dows, Iowa.
W. A. Helsell, B. Sc., Odebolt, Iowa.
J. B. Hungerford, B. Sc., Carroll, Iowa.
W. N. Hunt, B. Sc., Central City, Iowa.
*R. F. Jordon, B. Sc.
*Cora B. (Keith) Pierce, B. Sc.
E. L. King, B. Sc., Osceola, Nebraska.
G. I. Miller, B. Sc., Boone, Iowa.
Alice (Neal) Gregg, B. Sc., Traer, Iowa.
J. C. Milnes, B. Sc., Chicago, Illinois.
Cora M. (Patty) Payne, B. Sc., Linden, Iowa.
L. B. Robinson, B. Sc., Harlan, Iowa.
T. L. Smith, B. Sc., 134 Tenth Street, Milwaukee, Wisconsin.
F. L. Stratton, Osceola, South Dakota.
*H. M. White, B Sc.

GRADUATES OF 1878.

*Florence (Brown) Martin, B. Sc.
Richard Burke, B. Sc., Oskaloosa, Iowa.
H. L. Glenn, B. Sc., Helena, Montana.
A. E. Griffith, B. Sc., M. Sc., Wesley Church, E. Des Moines, Ia.

*Deceased.
LIST OF GRADUATES

M. M. Hitchcock, B. C. E., 412 Pullman Bldg., Chicago, Illinois
C. E. Martin, B. C. E., San Antonio, Texas.
J. C. Meridith, B. M. E., Kansas City, Missouri.
Emma (McHenry) Glenn, B. Sc., 924 11th Avenue, Helena, Mont.
D. McKinnon, B. Sc., California Jct., Iowa.
J. N. Muncey, B. Sc., Jesup, Iowa.

Ellen (Rice) Robins, B. Sc., Manchester, N. Hampshire.
W. K. Robbins, B. Sc., M. Sc., 290 McGregor St., Manchester, N. H.
L. (Shepherd) Beckwith, B. Sc., Pattlway, California.
Ida (Twichell) Blockman, B. Sc., Santa Maria, California.
E. G. Tyler, B. C. E., Logan, Iowa.
T. F. Lee, B. Sc., Lakeport, California.
G. W. Wilson, B. C. E., Rockwell, Iowa.
J. W. Whitney, B. Sc., Prairieburg, Iowa.
Belle Woods, B. Sc., Pueblo, Colorado.

GRADUATES OF 1879.

Malinda (Cleaver) Faville, B. Sc., 428 Poole St., Norfolk, Virginia.
*S. Carrie (Carter) Hanson, B. Sc
George C Faville, B. Sc., D V. M., 428 Poole St., Norfolk, Va
F. N Field, B. C. E., Burlington, Iowa.
A. L. Hanson, B. C. E., Ada, Minnesota.
T. V. Hoggatt, B. Sc., Valdez, Alaska.
J. E. Hyde, B. Sc., Fargo, North Dakota.
L. L Manwaring, B. Sc., Stillwater, Minnesota.

Jennie (McElyea) Beyer, B. Sc., Ames, Iowa.
*J C. Noble, B. Sc.
Herbert Osborne, B. Sc., M Sc, 485 King Ave., Columbus, Ohio.
J. D. Shearer, B. Sc., 517 First Ave., S Minneapolis, Minnesota.
Fremont Turner, B. M. E., 900 Sixteenth St., Des Moines, Iowa.
*Genevieve (Welch) Barstow, B. Sc
W. Whited, B Sc., 286 Main St., Station B., Pittsburg, Penn.
Alice (Whited) Burling, B. Sc., Eldora, Iowa.

GRADUATES OF 1880.

M. J. Bailey, B. Sc., Custer City, South Dakota.
*F. Boddy, B. Sc
O S. Brown, B Sc., Meservey, Iowa.
M. Hakes, B Sc., Laurens, Iowa.

*Deceased.
J. Hassett, B. Sc., Papillion, Nebraska.
E. D. Harvey, B. Sc.
D. S. Hardin, B. Sc., Alma, Nebraska.

C. H. McGrew, B. Sc.
R. M. Nicholson, B. Sc.
G. E. Reed, B. Sc.
J. L. Simcock, B. Sc., Adel, Iowa.
W. A. Thomas, D. V. M., Lincoln, Nebraska.
J. Vincent, D. V. M., Shenandoah, Iowa.
W. B. Welch, B. Sc., D. V. M., Marshall, Missouri.

GRADUATES OF 1881.

A. M. Beresford, B. Sc., Orleans, Oregon.
Thomas Burke, B. Sc., Baker City, Nebraska.
Marilla J. Crossman, B. Sc.
Chas. M. Coe, B. Sc., College and Broadway, Kansas City, Mo. F. E. Colby, B. C. E., U. S. Supply Company, Omaha, Nebraska.
J. S. Dewell, B. Sc., Mo. Valley, Iowa.
C. A. Dodge, B C E., Orange City, Iowa.
F. E. Furry, B. Sc., Alden, Iowa.
M. J. Furry, B. Sc., Alden, Iowa.
Julia M. Hanford, B. Sc., 811 S. 11th Street, Tacoma, Washington.
J. R. Hopkins, B. Sc.
J. S. McGavern, B. Sc., Mo. Valley, Iowa.
W. O. McElroy, B. C. E., Newton, Iowa.
Fanny J. (Peretti) Gault, B Sc., 520 N. G. St., Tacoma, Wash.
Alice I. (Sayles) Osborn, B Sc., 485 King Ave., Columbus, Ohio.
T. W. Shearer, B. Sc., Wallisville, Texas.

GRADUATES OF 1882.

W. D. Atkinson, B. Sc., Parsons, Nebraska.
J. A. Blaine, B Sc.
Etta M. Budd, B. Sc., Ames, Iowa.
George W. Catt, B. C. E., Bensonhurst-by-the-Sea, New York, N. Y.
Mary (Coe) Lorbeer, B. Sc., Holt Avenue, Pomona, California.
W. V. A. Dodds, B Sc., Beatrice, Nebraska.
W. M. Dudley, B. Sc., Villisca, Iowa.
H. J. Gable, B. Sc.
C. I. Lorbeer, B. Sc., Holt Avenue, Pomona, California.
J. B. Marsh, B. M. E., 1700 Ninth Street, Des Moines, Iowa.
E. A. McDonald, B. Sc., City of Mexico, Mexico.

*Deceased
J. R. McKim, B. Sc., 304 Maple Street, Kansas City, Missouri. 
Della A. Neal, B. Sc., Lake Charles, Louisiana. 
J. H. Patten, B. Sc., Denver, Colorado. 
Hattie A. Perrett, B. Sc., Rock Falls, Iowa. 
Lizzie Perrett, B. Sc., Rock Falls, Iowa. 
*Kitty E. Reeve, B. Sc. 
C. F. Saylor B. Sc., 1082 Twenty-First Street, Des Moines, Iowa. 
Sarah (Smith) McDonald, B. Sc., City of Mexico, Mexico. 
D. T. Stockman, B. Sc., Sigourney, Iowa. 
W. S. Summers, B. Sc., Omaha, Nebraska. 
W. W. Wheeler, B. Sc., 1715 Ninth Street, Des Moines, Iowa. 
W. U. White, B. Sc., Hope, South Dakota. 

GRADUATES OF 1883.

A. M. Allen, B. Sc., 2116 Kenwood Blvd., Minneapolis, Minn. 
G. M. Burnham, B. Sc., Ashland, Wisconsin. 
George Caven, B. C. E., 45-154 Lake Street, Chicago, Illinois. 
Virginia (Colclo) Quint, B. Sc., 1715 Ninth St., Des Moines, Iowa. 
Geo. W Curtis, B. S. A., M. S. A., Dallas, Texas. 
C. M. Doxsee, B. Sc., Algona, Iowa. 
*Lottie Estes, B. Sc. 
*Jessie E. (Frater) Muncey, B. Sc. 
R. M. Hunter, B. Sc., Sibley, Iowa. 
Minnie (Knapp) Mayo, B. Sc., Lake Charles, Louisiana. 
Herman Knapp, B. S. A., Ames, Iowa. 
Mary W. (McDonald) Knapp, B. Sc., Ames, Iowa. 
Kate (McNell) Wells, B. Sc., Sheridan, Wyoming. 
A. M. Miller, B. Sc., 1314 E. Thirteenth St., Des Moines, Iowa. 
E. Mead, B. C. E., U. S Department of Agri. Washington, D. C. 
Emily A. Reeve, B. Sc., Hartford, Connecticut. 
M. J. Riggs, B. C. E., American Bridge Co., 2301 Robinwood Avenue, Toledo, Ohio. 
S. C. Scott, B. Sc., Lyons, Iowa. 
*Effie G. Slater, B. Sc. 
F. J. Smith, B. Sc., Des Moines, Iowa. 
M. E. Wells, B. Sc., Sheridan, Wyoming. 
W. D. Wells, B. Sc., 1716 Park Avenue, Davenport, Iowa. 
Agatha M. (West) Ramsey, B. Sc., Rock Rapids, Iowa. 
Mabel A. (Young) Alexander, B. Sc., Clarion, Iowa. 

*Deceased.
### Graduates of 1884

<table>
<thead>
<tr>
<th>Name</th>
<th>Degree</th>
<th>Location</th>
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<tr>
<td>J. F. Armstrong, B. Sc.</td>
<td></td>
<td>South Dakota</td>
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<tr>
<td>Edna (Bell) Anderson, B. Sc.</td>
<td></td>
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<td>T. F. Bevington, B. Sc.</td>
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<td>Sioux City</td>
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<td>Geo. R. Chatburn, B. C. E.</td>
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<td>C. J. Clark, B. C. E.</td>
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<td>Denver</td>
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<td>J. E. Daugherty, B. C. E.</td>
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<td>W. P. Dickey, B. Sc.</td>
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<td>J. W. Gill, B. C. E.</td>
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<td>B. T. Hainer, B. Sc.</td>
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<td>Perry</td>
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<td>H. H. (Hainer) Gabel, B. Sc.</td>
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<td>Aurora</td>
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<td>*A. E. (Henry) Quint, B. Sc.</td>
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<td>G. B. Hibbs, B. Sc.</td>
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<td>F. A. Huntley, B. S. A.</td>
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<td>F. L. Lambert, B. S. A.</td>
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<td>W. E. D. Morrison, D. V. M.</td>
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<td>California</td>
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<td>E. J. Nichols, B. C. E.</td>
<td></td>
<td>Texas</td>
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<td>G. M. Osborn, D. V. M.</td>
<td></td>
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<td>F. L. Pitman, B. C. E.</td>
<td></td>
<td>Virginia</td>
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<td>J. F. Porter, B. C. E.</td>
<td></td>
<td>Illinois</td>
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<tr>
<td>Addie (Rice) Hainer, B Sc.</td>
<td></td>
<td>St Louis</td>
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<tr>
<td>C. H. Sloan, B. Sc.</td>
<td></td>
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<tr>
<td>G. W. Thompson, B. C. E.</td>
<td></td>
<td>Nebraska</td>
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<tr>
<td>C. Vincent, B. Sc.</td>
<td></td>
<td>Iowa</td>
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<tr>
<td>M. Vincent, B. S. A.</td>
<td></td>
<td>Texas</td>
</tr>
<tr>
<td>Ione (Weatherby) Marsh, B. Sc.</td>
<td>1700 Ninth St, Des Moines, Ia.</td>
<td>Webster City, Iowa</td>
</tr>
<tr>
<td>*W. J. Wicks, B. Sc.</td>
<td></td>
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<tr>
<td>W. H. Weir, B. Sc.</td>
<td></td>
<td>Alaska</td>
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<tr>
<td>Alfred Williams, B. C. E.</td>
<td></td>
<td>Skagway</td>
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<tr>
<td>Fannie R. Wilson, B. Sc.</td>
<td></td>
<td>Charles City, Iowa</td>
</tr>
<tr>
<td>G. W. Wormley, B. C. E.</td>
<td></td>
<td>Newton</td>
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</tbody>
</table>

### Graduates of 1885

<table>
<thead>
<tr>
<th>Name</th>
<th>Degree</th>
<th>Location</th>
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<tbody>
<tr>
<td>C. S. Bowie, B. M. E.</td>
<td></td>
<td>Tacoma, Wash.</td>
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<tr>
<td>C. A. Cary, B. Sc., D. V. M.</td>
<td></td>
<td>Auburn, Ala.</td>
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<tr>
<td>D. B. Collier, B. S. A.</td>
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<td>Io-w-a</td>
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<tr>
<td>G. F. Goodno, B. Sc., M. Sc.</td>
<td></td>
<td>Waukegan, Ill.</td>
</tr>
<tr>
<td>G. H. Glover, B. Sc., D. V. M.</td>
<td>39 Thirty-Fourth Ave, Helena, Mont</td>
<td>1533 Monadnock Block, Chicago, Ill.</td>
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<tr>
<td>E. Gray, B. C. E.</td>
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<tr>
<td>W. A. Grow, B. Sc.</td>
<td></td>
<td>Gransville, Mont.</td>
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<tr>
<td>W. H. Hays, B. S. A., M. S. A.</td>
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<td>St. Anthony Park, Minn.</td>
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<td>*E. N. Hill, B. M. E.</td>
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<tr>
<td>D. L. Hutchinson, B. C. E.</td>
<td></td>
<td>Goldfield, Colo.</td>
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<tr>
<td>Hannah (Hutton) Shearer, B. Sc</td>
<td></td>
<td>Wallisville, Texas</td>
</tr>
</tbody>
</table>

*Deceased.
LIST OF GRADUATES

L. D. Jackson, B. M. E.
M. E. Johnson, D. V. M., 107 Corning Street, Red Oak, Iowa.
G. W. Knorr, B. S. A., Clark's Station, Kentucky.
*C. J. Lee, B. Sc.
Frank Leverett, B. Sc., Ann Arbor, Michigan.
J. C. Lipes, B. Sc., Aurora, Missouri.
J. C. B. Lockwood, B. C. E., 70 Dexter Horton Blvd, Seattle, Wash.
*Anna G. (McConnon) Bevington, B. Sc.
L. F. McCoy, B. C. E., Davenport, Iowa.
A. G. Nosler, B. C. E., Dawson City, N. W. T.
W. B. Niles, D. V. M., Sigourney, Iowa.
*Oak G. Norton, B. S. A
J. G. Pope, B. M. E., Cuyahoga Falls, Ohio.
Emma M. (Porter) Sloan, B. Sc., Geneva, Nebraska.
A. U. Quint, B. Sc., 1715 Ninth Street, Des Moines, Iowa.
I. B. Schreckengast, B. Sc., Washington, Iowa.
Lydia A. (Schreckengast) Collier, B. Sc., Durant, Iowa.
S. Stewart, D. V. M., Kansas City, Kansas.
C. E. Underhill, B. Sc., Onawa, Iowa.

GRADUATES OF 1886.

J. W. Bradford, B. C. E., 10255 S. Elizabeth St., Chicago, Illinois.
B. Buchli, B. Sc., D. V. M., Alma, Kansas.
P. S. Burns, B. Sc., Boston, Massachusetts.
H. L. Chatterton, D. V. M., Peterson, Iowa.
S. D. Clough, B. Sc., Pine Bluffs, Arkansas.
M. Z. Farwell, B. Sc., La Junta, Colorado.
*V. C. Gambell, B. Sc.
W. E. Gamble, B. Sc., 100 State Street, Chicago, Illinois.
G. W. Green, B. S. A., 244, 246 Ex Bldg., South Omaha, Neb.
S. H. Hedges, B. C. E., 2134 West 103d Street, Chicago, Illinois.
W. B. Hunter, B. Sc., Cereal Company, Buffalo, New York, N. Y.
A. P. Johnston, B. C. E., Sigourney, Iowa.
G. A. Johnson, D. V. M., Sioux City, Iowa.
E. S. Johnson, D. V. M., Morning Sun, Iowa.
Lizzie Langfitt, B. Sc., Greenfield, Iowa.
H. L. Langfitt, B. Sc., Hutchinson, Minnesota.
W. R. Myers, B. Sc., Garvanza, California.
E. P. Niles, D. V. M., Kansas City, Kansas.
M. M. Reynolds, B. S. A. M., M. S. A., St. Anthony Park, Minn.
J. S. Richman, B. S. A., M. S. A., Fullerton, California.
H. S. Stewart, B. C. E., Texarkana, Texas.
J. J. Streets, D. V. M., Los Angeles, California.
Cora (Wagner) Hunter, B. Sc., Des Moines, Iowa.

*Deceased.
GRADUATES OF 1887.

*R. C. Bennett, D. V. M.
E. Besser, D. V. M., 419 Market Street, Logansport, Indiana.
C. M. Canady, B. C. E., American Bridge Company, 51st St., Pittsburgh, Pennsylvania.

Emma L. (Casey) Scofield, B. L., Glendora, California.
E. J. Christie, B. Sc., Cedar Rapids, Iowa.
*S. B. Clark, B. Sc.
*C. J. Cotey, B. Sc.
Esther Crawford, B. L., Dayton, Iowa.
C. F. Curtiss, B. S. A., M S. A.
A. C. Felt, B. Sc, Superior, Nebraska.
C. W. Ferguson, D. V M., Chappell, Nebraska.
*W. H. Frater, B. C. E.
G. S. Govier, B. C. E., Argentine, Kansas.
F H. Graves, D. V. M., Madrid, Iowa.
Norma (Hainer) Beach, B. Sc., Geneva, New York.
L. V. Harpel, B. Sc., Boone, Iowa.
N. E. Hansen, B Sc., M. Sc., Brookings, South Dakota.
F. W. Hoskins, D. V. M., Sioux Rapids, Iowa.
*W. S. Igo, D. V. M.
E A. Kirkpatrick, B Sc., M Ph., Fitchburg, Massachusetts.
F. W. Mally, B. Sc., M Sc., College Station, Texas.
O. E. McCarthy, B. C E.
A. E. Osborn, B Sc,
L. G. Patty, D. V. M., LaPorte City, Iowa.
Joseph Paxton, B. C. E., Carroll, Iowa.
J. A. Perley, B. C. E., Aspen, Colorado.
W. A. Peterson, B Sc, 3046 Wentworth Ave., Chicago, Illinois.
G. R. Randall, B. M. E., Monticello, Iowa.
G. L. Schermerhorn, B. M. E., 101 State St., Schenectady, N. Y.
C. L. Spencer, B S A., 222 W. Fourth St, Jacksonville, Florida.
G. W. Sturtz, B. S. A., Plainview, Nebraska.
John Tillie, D. V. M., Muscatine, Iowa.
Olive (Wilson) Curtiss, B. L., Ames, Iowa.
J. W. Wilson, D. V. M., Traer, Iowa.

GRADUATES OF 1888.

J. B. Allen, B. Sc., Codaz, Nebraska.
Clarence Baker, B. C. E., Centerville, Iowa.
Ethel Bartholomew, B. Sc., Chariton, Iowa.
Chas. L. Bartholomew, B. Sc., 523 E. 18th St., Minneapolis, Minn.
Scott Bradford, B. Sc., Storm Lake, Iowa.

*Deceased
A. Brandvig, B. Sc., Ottumwa, Iowa.
G. L. Buffington, D. V. M., Baxter, Iowa.
J. G. Davidson, B. M. E., 119th St., Whiting, Indiana.
F. L. Dobbin, B. Sc., State Center, Iowa.
*C. A. Finnigan, B. C. E.
Grant Flora, B. C. E., Estherville, Iowa.
W. N. Gladson, B. M. E., Fayetteville, Arkansas.
K. H. Granger, B. Sc., S. Weymouth, Massachusetts.
James E. Gyde, B. Sc., Wardner, Idaho.
Ella (Henderson) Bartholomew, B. L., 623 F. 18th St., Minneapolis, Minnesota.
Chas. W. Hunt, B. Sc., Woodbine, Iowa.
F. L. Lightner, B. Sc., Iowa Station, Louisiana.
Elizabeth Louise (McKuskey) Morrison, B. L., 1002 Third Avenue, Council Bluffs, Iowa.

G. L. Melsner, B. Sc., Liberty, Nebraska,
Laura R. Moulton, B. L., Seattle, Washington.
E. K. Paine, D. V. M., Cuba.
E. A. Sheafe, B Sc., 120 South Court Street, Ottumwa, Iowa.

B. J. Sheldon, B Sc., Ames, Iowa.
E. B. Skinner, B. Sc., Calliope, Iowa.
N. Spencer, B. Sc., Algona, Iowa.
C. E. Tallman, B. Sc., Scott's Station, Alabama.

W. L. Thompson, B Sc., Bayard, Iowa.
L. C. Tilden, B. Sc., Ames, Iowa.
W. E. Warwick, B. M. E., Whiting, Indiana.

Nannie E. Waugh, B. L., Manchester, Indiana.
Florence (Weatherby) Hainer, B. L., Perry, Oklahoma Territory.
Julia A. (Wentch) Stanton, B. L., Ames, Iowa.
W. H. Wright, B. Sc.,
Sherman Yates, B. Sc., Tipton, Iowa.

GRADUATES OF 1889.

Jas. A. Baker, B. Sc., Ames, Iowa.
J. E. Banks, B C. E., American Bridge Co., Pittsburg, Penn.
D. B. Bisbee, B Sc., 7340 Bond Avenue, Chicago, Illinois.
*A. E. D. Bosquet, D V M.
W. B Budrow, D. V. M., American Smelting & Refining Co,
Agnascaklientes, Mexico.

*H. W. Chamberlain, B. Sc.
*F. H. Cooley, B. C. E.

Harry B. Day, B. M. E., Seymour, Iowa.
H. A. Gossard, B Sc., Lake City, Florida.
B. T. Green, B Sc., Hawarden, Iowa.
W. R. Henson, B. Sc., Chinook, Montana.

*Deceased
IOWA STATE COLLEGE

Nellie Johnson, B. L., Edmond, O. T.
C. F. Kimball, B. N. E., Court House, Council Bluffs, Iowa.
C. W. Lamborn, B. C. E., 624, 184 LaSalle St., Chicago, Illinois.
John McBlirney, D. V. M., Clarinda, Iowa.
Albert McClelland, B. Sc., Ivy, Iowa.
A. A. McLaughlin, B. Sc., 217 Youngerman Block, Des Moines, Ia.
J. A. Melsness, B. Sc., Reinbeck, Iowa.
S. W. Morris, B. Sc., Corning, Iowa.
Belle Newell, B. L., Woodward, Iowa.
Ira A. Nichols, B Sc., Iowa Falls, Iowa.
W. H. Rickard, B. C. E., Texarkana, Arkansas.
P. H. Rolfs, B. Sc., M. Sc., Miami, Florida.
John Schoenleber, B. M. E.
W. U. Scott, B. Sc., Slater, Iowa.
J. O. Simcocke, D. V. M., Stuart, Iowa.
John A. Shelton, B. Sc., Butte, Montana.
Wm. R. Shoemaker, B Sc., 6124 Ingleside Ave., Chicago, Illinois.
Virgil Snyder, B Sc., A M., Ph. D., 204 Univ. Ave., Ithaca, N. Y.
Palmer W. Starr, B. C. E.
C. H. Stearns, B Sc., Santa Rosa, New Mexico.
John S Stroud, B Sc., Fifth and Walnut Sts, Des Moines, Iowa.
M. W. Thornburg, B. Sc., Redfield, Iowa.
Rosalia Thurliman, B. L., Carroll, Iowa.
C. M. Wade, B Sc., Sioux City, Iowa.
Mary C (Zimbleman) Otis, B. L., 322 Story St., Boone, Iowa.

GRADUATES OF 1890

Nettie Bannister, B L., Cherokee, Iowa.
Jay A Bishop, B. Sc., New Hampton, Iowa.
Wm E Bolles, B C. E., American Bridge Co., Minneapolis, Minn.
John A. Bramhall, B M E, Globe Machinery & Supply Co., Des Moines, Iowa.
Meyer Brandvig, B Sc., M Ph., Gilbert Station, Iowa.
Joseph A. Chamberlain, B Sc., Baltimore, Maryland.
Herbert E Crosby, B. Sc., Montevideo, Minnesota.
Chas D. Davidson, B. M. E., Whiting, Indiana.
W. C. Dewell, B. Sc., Magnolia, Iowa.
Mary E. (Fellows) Weare, B L., Morton Park, Illinois.
C. Quintus Fuller, D. V. M., Milford, Iowa.
Belle (Gaston) James.
J. Melville Graham, B Sc., Audubon, Iowa.
May Hardy, E. L.
Spencer Haven, B Sc., Hudson, Wisconsin.
Eugene Henley, B Sc., Brooklyn, Iowa.
E. Seigel Howard, B Sc., Highland Park, Des Moines, Iowa.

*Deceased.
Thos. S. Kerr, B. Sc., 2829 Calumet Avenue, Chicago, Illinois.
Edw. A. Kregor, B. Sc., Cherokee, Iowa.
Alice Mann, B. Sc., Algona, Iowa.
Bertha Mann, B. Sc., Algona, Iowa.
James McLaughlin, D. V. M., Blue Earth City, Minnesota.
Ada (Mills) Dewell, B. L., Magnolia, Arizona.
Violet U. Quarter, B. L., Webster City, Iowa.
Maria M. Roberts, B. L., Ames, Iowa.
Geo. H. Schulte, B. Sc., Elkhader, Iowa.
Wm. H. Shaul, B. Sc., Des Moines, Iowa.
Kate (Stevens) Harpel, B. L., Boone, Iowa.
John T. Stinson, B. Sc., Mountain G'Ve, Missouri.
Rodney B. Swift, B. Sc., 4837 Madison Ave., Chicago, Illinois.
Edward Thurliman, B. Sc., Carroll, Iowa.
Leo. Thurliman, B. Sc., M. Sc., 1733 Monadnock Bldg, Chicago, Ill.
Cora H. T. (Van Velser) Lambert, B. L., 7306 South Green St.,
Chicago, Illinois.
A. R. Williams, D. V. M., Glenwood, Iowa.

GRADUATES OF 1891.

Geo. A. Angus, B. C. E., Chicago Heights, Chicago, Illinois.
Wm. H. Austin, D. V. M., Newton, Iowa.
Chas. A. Ballreich, B. Sc., Box 737, Houston, Texas.
Sara T. Barrows, B. L., Columbus, Ohio.
Frank J. Browne, B. C. E., Pipestone, Minnesota.
Donald M. Carter, B. M. E., 1410-204 Dearborn St., Chicago, Ill.
Geo. L. Christy, B. C. E., 128 W. 128 Street, New York, N. Y.
*Clinton C. Clarke, B. Sc.
May (Cottrell) Woods, B. L., Woodward, Iowa.
Wm. A. Hack, D. V. M., Maquoketa, Iowa.
Wm. H. Heileman, B. Sc., M. Sc., Dept. of Agriculture,
Washington, D C.

Rollin E. Hinds, B. C. E., Ottumwa, Iowa.
R. Frederick Hodson, B. Sc., Ames, Iowa.
E. P. Hudson, B. Sc., Britt, Iowa.
Thomas B. Hutton, B. Sc., Odebolt, Iowa.
Wm. H. Jackson, B. C. E., 1522 11th Street, Des Moines, Iowa.
Chas. W. Johnson, B. Sc., Charles City, Iowa.
Edwin S. King, B. Sc., Grundy Center, Iowa.
Eleanor (King) Moss, B. L., 1052 20th St., Des Moines, Iowa.
Wm. A. McClanahan, D. V. M., Redding, Iowa.
L. D. McNaughton, B. M. E., Eagle Grove, Iowa.
John H. Moore, B. C. E., 814 Foster St., Evanston, Illinois.
Berkley Moss, B. C. E., 1052 20th Street, Des Moines, Iowa.
Mary A. Nichols, B. L., B Sc. 246 W. 84th St., New York, N. Y.
E. C. Oggel, B. Sc., Los Angeles, California.

*Deceased.
John F. Schulte, B. Sc.,
Benjamin F. Shaum, B. C. E.,
J. H. Shepperd, B. Ag., M.S.A.,
A. A. Sirrine, B. Sc., M. Sc.,
Nels Sorenson, D. V. M.,
John E. Spaan, B. Sc.,
Grant F. Starkey, D. V. M.,
Walter D. Steele, B. M. E.,
Willis C. Swift, B M. E., 55
Dennis A. Thornburg, B. Sc.,
Samuel Whitbeck, D. V. M.,
Peter M. Wilson, D. V. M.,

Victor,
Columbus City,
Fargo,
Jamaica,
Indianapolis,
Indianapolis,
Jordon,
New York City,
Koepnicker St., Berlin, Germany.
Grinnell,
Decorah,
Traer,

Iowa.
Iowa.
Iowa.
Indiana.
Indiana.
Iowa.
New York.
Iowa.
Iowa.

GRADUATES OF 1892

Geo. B. Ashford, B. C. E., Nevada, Iowa.
R. B. Benjamin, B. Sc., 1992 W. Van Buren St., Chicago, Ill
Alice M. Beach, B. Sc., M. Sc., Urbana, Illinois.
Estella (Blaine) Spence, B. L., 1030 17th Street, Des Moines, Ia
Emma H (Boyd) Jones, B L., 5540 Monroe Ave., Chicago, Ill
Eugene G. Brown, B. Sc., Mason City, Iowa.
Geo. W. Brown, B. C. E., Boone, Iowa.
Inez J. Christie, B. L., East St. Louis, Illinois.
F. E. Clinton, B. C. E., 703 Irving St., Portland, Oregon.
W. Ross Cooper, D. V. M., Kansas City, Missouri.
Edgar C Corry, B. Sc., Manhattan Building, Des Moines, Iowa.
Genevieve Culver, B. L., Audubon, Iowa.
Homer Davis, D. V. M., B. Sc., M. Sc., 2617 Franklin St,

Omaha, Nebraska

Anna (Dean) Blair, B. L.,
Chas. C. Deering, B. Sc.,
C. U. Emry, B. C. E.,
Geo. S Foster, B. C. E.,
Kittle B. Freed, B. L.,
Ellis T. Gilbert, B. Sc., 202 N.
Eugene B. Henry, B. Sc.,
Wm. C. Hicks, B. Sc., 9909
Edwin D. Jones, B. C. E.,
Elmer E. Kaufman, B. Ag.,
S. Arthur Knapp, B. Sc.,
E. A. Littell, B. C. E.,
C. W. Mally, B. Sc., M. Sc.,
Jessie (Maxwell) Freeland, B. L., 101 G. St., Salt Lake City, Utah.
Frank L. Meredith, B. Sc.,
Clarice (McCarthy) McNaughton, B. L., Eagle Grove, Iowa.
Wilton McCarthy, B. V. M., 5th and Walnut Sts., Des Moines, Ia.
E. S. McCord, D. V. M.,
W. P. Milburn, B. M. E.,
Gordon P Miller, B. Sc.,

E. Des Moines, Iowa.
Boone, Iowa.
Fairfield, Iowa.
Klamath Falls, Oregon.
Ewing Avenue, Chicago, Illinois.
Hamburg, Arkansas.
Fargo, North Dakota.
Lake Charles, Louisiana.
Audubon, Iowa.
Cape Town, South Africa.
Ames, Iowa.
Ames, Iowa.
Eby, California.
Des Moines, Iowa.
C. R. Mollison, D. V. M., Graettinger, Iowa.
Jennie (Morrison) Beyer, B. Sc., Ames, Iowa.
Fred S. Phelps, B. Sc., Gurnee, Illinois.
Kate M. (Porter) Gess, B. L., St. Anthony, Idaho.
Jerry Replogle, D. V. M., Centerville, Iowa.
John A. Rolfe, B. Sc., Eldridge, Iowa.
T. T. Rutledge, B. Ag.
Robt. Sloan, B. Sc., Geneva, Nebraska.
Arthur C. Stokes, B. Sc., Omaha, Nebraska.
*C. E. Swenson, B. Sc.
C. C. Van Houten, B. Ag., Ames, Iowa.
H. E. Wallace, B. Ag., Des Moines, Iowa.
G. S. Waterhouse, D. V. M., Charter Oak, Iowa.
Elmina T. Wilson, B. C. E., C. E., Ames, Iowa.
Flora H Wilson, B. L., Washington, D C.
Vincent Zmunt, B. Sc., Iowa City, Iowa.

GRADUATES OF 1893

Frank W. Austin, B. C. E., Manvel, California.
Bert Benjamin, B M. E., 1193 Millard Ave., Chicago, Illinois.
E. C. Boutelle, B. M. E., 499 La Salle Avenue, Chicago, Illinois.
C. E. Brown, B M. E., Peterboro, Ontario, Can.
A. Alene (Chestek) Stewart, B. L., 48 Brook St., Geneva, N. Y.
D. G. Cooper, D. V M., 2626 Capitol Ave., Omaha, Nebraska.
F. E. Davidson, B. C. E., 7406 Kimback Ave., Grand Crossing, Chicago, Illinois.

C. M. Day, D. V. M., St Joseph, Missouri.
Earl Douglass, B. Sc., Brookings, South Dakota.
Jennie Downing, B. L., Sioux Rapids, Iowa.
Edwin M. Duroe, Creston, Iowa.
R. H. Fairfield, B. Ag., Bozeman, Montana.
Kate M. Farr, B. L., Sioux City, Iowa.
E. E. Faville, B. Ag., Mo. Valley, Iowa.
Margaret I. (Gifford) Hodson, B. L., Ames, Iowa.
Ernest F. Green, B. Sc.
*J. LeRoy Guernsey, C. E.
W. E. Harriman, B. Sc., M. D, Ames, Iowa.
C. E. Hart, B. M. E., Davenport, Iowa.
W. E. Herring, B C. E., 224 Bowen St., St. Louis, Missouri.
Royal T. Hodgkins, B. M. E., New York City, New York.

*Deceased
<table>
<thead>
<tr>
<th>Name</th>
<th>Address Details</th>
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<tbody>
<tr>
<td>Jessie B. Hudson</td>
<td>Lansing, Iowa</td>
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<tr>
<td>Geo. W. Hursey</td>
<td>Hedrick, Iowa</td>
</tr>
<tr>
<td>Jno. A. James</td>
<td>3883 Washington Blvd., St. Louis, Missouri</td>
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<tr>
<td>J. F. Jones</td>
<td>Iowa City, Iowa</td>
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<tr>
<td>Edward J. Kearney</td>
<td>905 State St., Milwaukee, Wisconsin</td>
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<tr>
<td>Fred L. Kent</td>
<td>Corvallis, Oregon</td>
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<td>G. A. Ketterer</td>
<td>Circle City, Alaska</td>
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<tr>
<td>G. A. Kuehl</td>
<td>933 Turner Avenue, Chicago, Illinois</td>
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<tr>
<td>Willis E. Lincoln</td>
<td>Nashville, Tennessee</td>
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<td>Willard C Lusk</td>
<td>Lincoln, Nebraska</td>
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<tr>
<td>J. A. Maguire</td>
<td>1005-100 Washington St., Chicago, Ill.</td>
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<tr>
<td>Berthold W. Manville</td>
<td>1104 Ella St., Beatrice, Nebraska</td>
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<tr>
<td>P. J. Maguire</td>
<td>1005-100 Washington St., Chicago, Illinois</td>
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<tr>
<td>C. A. McCall</td>
<td>Kansas City, Kansas</td>
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<tr>
<td>G. E. McKim</td>
<td>St. Joseph, Missouri</td>
</tr>
<tr>
<td>Ira J. Merri'1</td>
<td>335 Wabash Ave., Chicago, Illinois</td>
</tr>
<tr>
<td>Charles L. Miles</td>
<td>Charles City, Iowa</td>
</tr>
<tr>
<td>Grace Mills</td>
<td>Flandreau, South Dakota</td>
</tr>
<tr>
<td>Ella B. (Morton) Kearney</td>
<td>905 State St., Milwaukee, Wis.</td>
</tr>
<tr>
<td>C. K. Munns</td>
<td>Corning, Iowa</td>
</tr>
<tr>
<td>H. H. Nichols</td>
<td>Marshalltown, Iowa</td>
</tr>
<tr>
<td>D W Patton</td>
<td>822 E 48th Street, Chicago, Illinois</td>
</tr>
<tr>
<td>Florence G. (Parkhill)</td>
<td>Kuehl, B. L., B. Sc., 933 Turner Ave., Chicago, Illinois</td>
</tr>
<tr>
<td>Lavenia Price</td>
<td>1602 Locust Street, Des Moines, Iowa</td>
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<tr>
<td>Helen Radnich</td>
<td>Davis City, Iowa</td>
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<tr>
<td>Roscoe G. Rice</td>
<td>237-30th Street, Chicago, Illinois</td>
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<tr>
<td>Mary C. Rolfs</td>
<td>Fairfield, Illinois</td>
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<tr>
<td>Wilmont G. Rundall</td>
<td>Buffalo, New York</td>
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<tr>
<td>E. E. Smith</td>
<td>Sioux Rapids, Iowa</td>
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<tr>
<td>F. S. Tufts</td>
<td>5726 S. Green Street, Chicago, Illinois</td>
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<tr>
<td>Belle (Wentch) Wood</td>
<td>Traer, Iowa</td>
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<tr>
<td>B. F. White</td>
<td>Hampton, Iowa</td>
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<tr>
<td>Vinnie (Williams) Grattan</td>
<td>Barr, Colorado</td>
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</tbody>
</table>

**Graduates of 1894.**

<table>
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<th>Name</th>
<th>Address Details</th>
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<tr>
<td>W. J. Ballard</td>
<td>Irvington, Iowa</td>
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<tr>
<td>Cassie Pearl Bigelow</td>
<td>415 West 22nd, Pueblo, Colorado</td>
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<tr>
<td>O. N. Bossingham</td>
<td>Algonia, Iowa</td>
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<tr>
<td>Harry S. Bowen</td>
<td>224 E. Sixty-fifth St., Chicago, Illinois</td>
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<tr>
<td>S. D. Bowie</td>
<td>Chelan, Washington</td>
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<tr>
<td>Blanche M (Bradley) White</td>
<td>B. L., Hampton, Iowa</td>
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<td>W. J. Burdess</td>
<td>Oskaloosa, Iowa</td>
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<tr>
<td>L. Iowa Campbell</td>
<td>Newton, Iowa</td>
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<tr>
<td>Frank H. Campbell</td>
<td>1528 Pruitt St., Fort Worth, Texas</td>
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<tr>
<td>W. G. Carlson</td>
<td>Willow Lake, South Dakota</td>
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</tbody>
</table>

*Deceased*
G. W. Carver, B. Ag., Tuskegee, Alabama.
Ida M. (Clark) Campbell, B. L., Clear Lake, Iowa.
Louis B. Craig, B. M. E., 764 Esplanade Ave., Davenport, Iowa.
Ella B. Curtis, B. L., Independence, Iowa.
Fannie E. (Curtiss) Craig, B. L., 764 Esplanade Ave., Davenport, Iowa.
W. R. Cooper, B. Sc., Newton, Iowa.
E. C. Dickinson, B. M. E., 495 Laurel Street, Elgin, Illinois.
S. R. Fitz, B. Sc., Steamboat Rock, Iowa.
Annie W. Fleming, B. Sc., Ames, Iowa.
Anna Georgen, B. L., Worthington, Iowa.
W. H. Gemmill, B. Sc., Sigourney, Iowa.
Emil Hansen, B. M. E., Great Falls, Montana.
Alvin W. Hoyt, B. Sc., 1402 A Avenue, Cedar Rapids, Iowa.
Winifred (Hunter) Evans, B. L., Searsboro, Iowa.
Burton D. Knickerbocker, B. M. E., 1233 Jackson Blvd., Chicago, Ill.
H. R. Kreger, B. Sc., Bloomfield, Nebraska.
W. G. Langfitt, B. M. E., Hutchinson, Minnesota.
C. G. Lee, B. Sc., Ames, Iowa.
Charles Lincoln, B M. E., Detroit, Michigan.
Scott W. Linn, B. M. E., Cleveland, Ohio.
E. M. S. McLaughlin, B.M.E., Newton, Iowa.
Alex. McKinnon, B. M. E., Windsor, Connecticut.
W. L. Meinzer, B. Sc., Howard, South Dakota.
John Meissner, B. Sc., Leighton, Iowa.
J. C. Miller, B. C. E., Galesburg, North Dakota.
Bertha M. (Mosler) Hays, B. L., Armstrong, Iowa.
W. A. Murphy, B. M. E., 1527 S. Twelfth St., St. Joseph, Missouri.
Emma (Pammel) Hansen, B. L., M. Sc., Brookings, South Dakota.
Nora M. (Person) Sanborn, B. L., 1369 Indiana Avenue, Salt Lake City, Utah.
Albert M. Price, B. M. E., 376 Chicago Street, Elgin, Illinois.
C. E. Read, B. Ag., New Virginia, Iowa.
C. D. Reed, B. Ag., Vicksburg, Mississippi.
Herbert Rutledge, B. M. E., Koszata, Iowa.
Edith B (Ryan) Faville, B.L., Sioux City, Iowa.
W L. Ryan, B. Sc., 1141 Nineteenth Street, Des Moines, Iowa.
Geo. T. Schlenker, B. Sc., E. Des Moines, Iowa.
A. H. Seaver, B. C. E., Nashville, Iowa.
Harry Shank, D. V. M., Millersburg, Iowa.
Maha (Silliman) Munns, B. L. C., Corning, Iowa.
Emma F. Sirrine, B. Sc., M. Sc., Dysart, Iowa.
*H. J. Stevens, D. V. M.
A. W. Stuntz, B. E. E., Owensburg, Kentucky.
Clarence Van Epps, B. Sc., Clinton, Iowa.
Arthur R. Wake, D. V. M., Omaha, Nebraska.
Carter B. Weaver, B. Sc., Ames, Iowa.
Alda Wilson, B D. E., 425 Beldin Avenue, Chicago, Illinois.

*Deceased
Ellsworth Wilson, D. V. M., Jewell, Iowa.
Elvin J. Wilson, D. V. M., North English, Iowa.
J. T. Young, B. M. E., Milton, North Dakota.

GRADUATES OF 1895.

Florence A. (Baker) McManus, B. Sc., 1212 E. Pierce St., Council Bluffs, Iowa.

Elmer D. Ball, B. Sc., M. Sc., Logan, Utah.
A. J. Banks, B. M. E., Montour, Iowa.
A. W. Bitting, D. V. M., B. S., Lafayette, Indiana
Richard Blanche, L. V. M., Marshalltown, Iowa.
C. E. Brockhausen, B. M. E,, 543 35th Street, Chicago, Illinois.
Ira C. Brownlie, B. Sc., D. D. S., 305 Tabor Opera House Building, Denver, Colorado.

Charles Cave, B. E. E., Waverly, Iowa.
Effie J. (Curtis) Campbell, B. L., 1528 Pratt St., Fort Worth, Tex.
J. G. Danielson, B. Ag., Harcourt, Iowa.
J. R. Davidson, B. Sc., Louisville, Kentucky.
E. T. Davidson, D. V. M.

Ruth (Duncan) Tilden, B. L., Ames, Iowa.
C. R. Duroe, B. M. E., Sioux Rapids, Iowa.
W. J. Eck, B. M. E., 156 Lake St., C. & N. W. R'y., Chicago, Ill
A. H. Foster, B. M. E., New Bedford, Massachusetts.
Jerome B. Frisbee, B. Ag., Sheldon, Iowa.
Burt German, B. M. E., Dayton, Ohio.
Clarence Goddard, B. C. E.

W. E. Gossard, B. Sc., Webster City, Iowa.
G. D. Gunn, B. Sc., Sumner, Nebraska.
Geo. W. Hardin, B. Sc., Castle, Montana.
A. C. Helmer, B. M. E., Davenport, Iowa.
D. M. Hosford, B. E. E., 28 Kenwood Street, Cleveland, Ohio.
N. C. Hurst, B. M. E., Burlington, Iowa.
Chas. Stewart Hutchinsons, B Sc., M. D., Harrison, Arkansas.

*Ira B. Johnson, B. Sc.

Fred J. Lazelle, B. Sc., Cedar Rapids, Iowa.
C. C. Lewis, B. M. E., Nira, Iowa.
H. T. Lewis, B. M. E., Pony, Montana.
John W. Lewis, B. C. E., Ft Sheridan, Chicago, Illinois.
L. L. Lewis, D. V. M., Stillwater, O. T.
G. W. Louthan, B. Ag., Linn Grove, Iowa.
F. R. Lyford, B. C. E., R. F. D. No. 5, Kansas City, Missouri.
Nellie Maguire, B. L., 249 Selby Avenue, St. Paul, Minnesota.
W. R. McCreary, B. C. E., 3847 Ellis Avenue, Chicago, Illinois.
Mary B (McNeil) Aten, B. L., Garden Grove, Iowa.
A. E. Mellinger, B. M. E., 59 Aberdeen Street, Chicago, Illinois.

*Deceased
LIST OF GRADUATES

Lillian Mills, B. L., Flandreau, South Dakota.
J. A. Moore, B. C. E., 4621 Champlain Ave., Chicago, Illinois.
Hulda M. Nelson, B. Sc.
Wm. J. Oliver, B. Sc., Armotor Co., Chicago Heights, Chicago, Ill.
Morrill J. Orr, B. M. E., 1329 Jennings St., Sloux City, Iowa.
Mabel Ruth (Owen) Wilcox, B.L., Washington D.C.
Lola A. Placeway, B. Sc., Ames, Iowa.
John M. Preston, B. Ag.
Erwin E. Reed, B. Sc., Monticello, Iowa.
Thomas L. Rice, D. V. M., 4521 Evans Avenue, Chicago, Illinois.
Albert Richmond, B. C. E., Edmunds, North Dakota.
F. S. Roop, D. V. M., 214 Fourteenth St., Charlottsville, Virginia.
Ethel B. Rundall, B. Sc., Rodman, Iowa.
Geo. D. Sabin, B. M. E.
J. C. Sample, B. C. E., 2531 Magnolia Street, Chicago, Illinois.
Roger S. Sanborn, B. Sc., 1369 Indiana Ave., Salt Lake City, Utah.
Fred Schleiter, B. E. E., Galva, Iowa.
J. I. Schulte, B. Ag., 1921 Thirteenth St., N. W., Washington, D.C.
John M. Sokol, B. Sc., Cook County Hospital, Chicago, Illinois.

R. H. Walker, B. M. E., Osage, Iowa.
Etta J. Whipple, B. Sc., 506 Lee Avenue, South Ottumwa, Iowa.
Chas. A. Wilson, B. Ag., U. S. Stock Yards, Chicago, Illinois.
E. R. Wilson, B. Ag., Chenoy, Washington.
O. P. Woodburn, B. M. E., Rock Rapids, Iowa.
John I. Wright, B. Ag., Kilduff, Iowa.
Laura (Wyatt) Cutler, B. Sc., Harlan, Iowa.

GRADUATES OF 1896.

Mildred Anderson, B. L., Walnut, Iowa.
Carlton R. Ball, B. Sc., M. Sc., Washington, D. C.
Hazel Leona (Beardshear) Chambers, B. L., 2205 Lincoln Avenue, Denver, Colorado.

J. F. Blakemore, B. C. E., Bedford, Iowa.
Elmer N. Bonnell, B. Sc., Davenport, Iowa.
W. A. Bryan, B. Sc., Honolulu, H I.
Agnes M. Cole, B. Sc., Cleveland, Ohio.
Robert Combs, B. Sc., M. Sc.
Bert Dunham, B. E. E., 85 Hammond Street, Chicago, Illinois.
Raymond B. Eckles, B. Ag., Doylestown, Pennsylvania.
J. J. Edgerton, B. Ag., 166 Adams St., Prairie Farmer, Chicago, Illinois.

James W. Elliott, B. C. E., Toledo, Ohio.
Nettie A. Fibbs, B. C. E., 1212 Fifth Avenue, S. Ft. Dodge, Iowa.
Edith (Foster) Orr, B. Sc., 1329 Jennings, St., Sloux City, Iowa.
Ella Weed (French) Robinson, B. Sc., Hampton, Iowa.
Frank E. French, B. C. E., Ames, Iowa.

*Deceased
L. M. Goodman, B. M. E., Britt, Iowa.
Maud Hursey, B. L., Moravia, Iowa.
C. P. Johnson, B. Sc., Jamaica, Iowa.
C. F. Langlass, B. M. E., 608 W. 113th St., New York City, N. Y.
Robert R. Landon, B. M. E., 1115 G. Street, N. W. Washington, D.C.
Myrtle (Little) Fowler, B. L., Ames, Iowa.
Nora Lockwood, B. Sc., George, Iowa.
Elbert C. Macy, B. C. E., 457 Laurel Avenue, St. Paul, Minnesota.
Stella (McLain) Lawrence, B. L., Boone, Iowa.
Carl H. McLean, B. Ag., M. Ph., Baxter, Iowa.
Mary J. Maguire, B. Sc., Creighton, Nebraska.
T. J. Mahoney, B. Sc., Boone, Iowa.
*Watson Mason, B. M. E.
Fred W. Mathews, B. Sc., Jefferson, Iowa.
Ira J. Mead, B. Ag., M. S. A., Ames, Iowa.
Claude C. Mills, B. Sc., Linden, Iowa.
S. B. Mills, B. Ag., Ames, Iowa.
C. O. Pool, B. Sc., Bedford, Iowa.
Lillian Porterfield, B. Sc., Dundee, Illinois.
Herbert L. Preston, B. Sc., Brocksburg, Nebraska.
Ivan B. Roscoe, B. Sc., Portsmouth, Iowa.
Rose (Rummel) Smith, B. Sc., Ames, Iowa.
E. A. Sherman, B. Sc., Hamilton, Montana.
Geo. L. Steelsmith, B. Sc., Dawson City, Alaska.
Henry C. Taylor, B Ag., Madison, Wisconsin.
Robert G. Weaver, B. Sc., New York City, New York.
W. W. Wench, B. M. E., New Orleans, Louisiana.
B. W. Wilson, B. Ag., Butte, Montana.
Jas. W. Wilson, B. Ag., M. Ag., 2101 S. St., N. W., Washington, D. C.
Arthur L. Zinzer, B. Sc., Storm Lake, Iowa.
Geo. W. Zorn, B. C. E., Cheyenne, Wyoming.

GRADUATES OF 1897.

Mary Ellen Barger, B. Sc., Ontario, Iowa.
C. A. Bergeman, B. M. E., Grand Works, Illinois.
Frank W. Bouska, B. Ag., Ames, Iowa.
Guy S. Brewer, B. Sc., 1327 E. 9th Street, Des Moines, Iowa.
Andrew Brown, B. Sc., Whitaker Building, Davenport, Iowa.
Jas. R. Burnip, B. Sc., Marathon, Iowa.
Philip E. Damon, B. Ag., Yelville, Arkansas.
Geo. Dana, B. M. E., 921 Main Street, Racine, Wisconsin.
Ole Davidson, B. C. E., Marshalltown, Iowa.
Gwendolen (Doxsee) Reed, B. L., Monticello, Iowa.
Louis A. Duroe, B. Sc., Sioux Rapids, Iowa.
L. Mae (Fellows) Banks, B.L., Montour, Iowa.
Wallace G. Gaberson, B. Sc., Sibley, Iowa.

*Deceased.
Otto H. Gersbach, B. C. E., 6040 Ellis Ave., Chicago, Illinois.
Blanche E. (Greeley) Wilson, B. L., 6401 Parnell Ave., Chicago, Ill.
Margaret Jones, B. Sc., 604 W. Adams Street, Chicago, Illinois.
Ward M. Jones, B. C. E., Ames, Iowa.
Wm. S. Joseph, B. C. E., Creston, Iowa.
Robert E. King, B. Sc. in E.E., Cripple Creek, Colorado.
Helen L. (Knapp) Fay, B. L., 921 7th St., Des Moines, Iowa.
Edwin P. Kribbs, B. Sc. in Min. E., Grave, Oregon.
Chas. E. LeBuhn, B. Sc., Davenport, Iowa.
Frank W. Linebaugh, B. M. E., Ames, Iowa.
Thomas W. Mast, B. Ag., Mt. Vernon, South Dakota.
Frank McConnon, B. Sc., Monticello, Iowa.
George B. McWilliams, B. C. E., Waterloo, Iowa.
Ellen A. (Morphy) Tilden, B. L., Ames, Iowa.
Joseph S. Morrison, B. C. E., Mason City, Iowa.
Wilmon Newell, B. Sc., M. Sc., State Entomologist, Georgia.
Ernest A. Pattengill, B. S., Ames, Iowa.
Geo. W. Patterson, B. Sc. in E. E., 257 Rice St., St. Paul, Minn.
Allen Rae, B. M. E., 430 North Pine Street, Austin, Illinois.
Edith Redmond, B. L., Highland Cen., Iowa.
Emerson G. Reed, B. Sc. in E. E., Elkhart, Indiana.
Edward F. Rhodenbaugh, B. Sc., Denison, Iowa.
Ambrose C. Rice, B. Sc., Des Moines, Iowa.
Moss F. Rolfe, B. Sc., Goodell, Iowa.
Margaret H. Rutherford, B. Sc., Crystal, North Dakota.
Arthur F. Sample, B. Ag., Lebanon, Iowa.
Herman T. Schmidt, B. Sc. in E. E., 1342 W. 3rd St., Davenport, Ia.
Frank B. Spencer, B. Sc. in E. E., 1105 Merchants Loan &
Trust, 135 Adams Street, Chicago, Illinois.
Olive E. Stevens, B. L., Ames, Iowa.
Clarence E. Tanton, B. Sc., Boone, Iowa.
Hannah M. Thomas, B. Sc., Corning, Iowa.
Minta A. (Tilden) Macy, B. L., St. Paul, Minnesota.
Edwin R. Townsend, B. M. E., Cleveland, Ohio.
John James Vernon, B. Ag., M. Sc., Mesilla Park, New Mexico.
Ida L. Watkins, B. L., Grundy Center, Iowa.
Jasper Wilson, B. Ag., Washington, D. C.
Lawrence Winne, B. Sc., Humboldt, Iowa.
Clarence A. Hartman, B. Sc., Des Moines, Iowa.

GRADUATES OF 1898

Moses C. Adamson, B. Sc., Dana, Iowa.
Ralph W. Barclay, B. Ag., West Liberty, Iowa.
Amanda J. Barger, B. Sc., Ontario, Iowa.
Esther (Beatty) Ketchum, B. L., 909 Locust St., Kansas City, Mo.
John N. Bonnell, B. Sc., Davenport, Iowa.
Leora May Bonwell, B. Sc., Viola Center, Iowa.
Otis S. Boyd, B. Sc., Roland, Iowa.
<table>
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<tr>
<th>Name</th>
<th>Education</th>
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<tr>
<td>Harvey D. Bozarth</td>
<td>B.E., Schenectady</td>
<td>New York</td>
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<td>Cyrus J. Bristol</td>
<td>B. M. E., Des Moines</td>
<td>Iowa</td>
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<td>Harry J. Brown</td>
<td>B. Sc., Ames</td>
<td>Iowa</td>
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<td>John C. Brown</td>
<td>B. Ag., M. Sc., 430 Francis St., Madison, Wis.</td>
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<tr>
<td>Olive Z. Brown</td>
<td>B. L., 609 23rd and L Sts., S. Omaha, Nebraska</td>
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<td>Edna M. (Burrham) Eckles</td>
<td>B. L., Doylestown, Pennsylvania</td>
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<td>Glenn C. Clark</td>
<td>B. Sc., 1001 Nat'l Life Bldg., Chicago, Illinois</td>
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<td>Margaret M. Cooper</td>
<td>B. L., Magnolia, Iowa</td>
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<td>John Craig</td>
<td>B. Ag., Ithaca, New York</td>
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<td>W. J. Devine</td>
<td>B. E. E., 423 Seventh Avenue, Clinton, Iowa</td>
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<td>Harry E. Dyer</td>
<td>B. Sc., St. Louis, Missouri</td>
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<td>Willis C. Edson</td>
<td>B. Sc., Storm Lake, Iowa</td>
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<td>Ada (Ellis) Johnson</td>
<td>B. L., Jamaica, Iowa</td>
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<td>Sadie Ellis</td>
<td>B. L., Philadelphia, Pennsylvania</td>
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<td>Harry J. Evans</td>
<td>B. Ag., Humboldt, Iowa</td>
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<td>Frederick Faville</td>
<td>B. Sc., Storm Lake, Iowa</td>
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<td>Oliver J. Fay</td>
<td>B. Sc., 921 Seventh Street, Des Moines, Iowa</td>
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<td>Elmer Franklin</td>
<td>B. Sc., Platteville, Iowa</td>
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<td>Orville S. Franklin</td>
<td>B. Sc., Des Moines, Iowa</td>
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<td>James Galloway</td>
<td>B. M. E., Milwaukee, Wisconsin</td>
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<td>Thomas Galloway</td>
<td>B. M. E., Burlington, Iowa</td>
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<td>Theron S. Grant</td>
<td>B. Sc., Lusk, Wyoming</td>
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<td>Howard N. Grettenberg</td>
<td>B. Ag., M. Sc., Lockland, Ohio</td>
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<td>J. H. Grisdale</td>
<td>B. Ag., Ottawa, Ontario</td>
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<td>Wm. H. Grover</td>
<td>B. E. E., Cherokee, Iowa</td>
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<td>Manlon J Hammer</td>
<td>B C. E., 6040 Ellis Avenue, Chicago, Illinois</td>
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<td>Chas. D. Heckard</td>
<td>B. V. M., Wheatland, Iowa</td>
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<td>Ole J. Henderson</td>
<td>B. Sc., Webster City, Iowa</td>
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<td>Benj. H. Hibbard</td>
<td>B. Ag., Ames, Iowa</td>
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<td>Elmer R. Hodson</td>
<td>B. Sc., M. Sc., Washington, D. C</td>
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<td>Ralph H. Hollenbeak</td>
<td>B. C. E.</td>
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<td>Sarah C. Hook</td>
<td>B. L., Ames, Iowa</td>
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<td>Monroe R. Hull</td>
<td>B. Sc., B. M. E., Jones &amp; Laughlin Steel Co., Pittsburg, Pennsylvania</td>
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<td>Ewing M. Johnson</td>
<td>B. Sc., Greene, Butler County, Iowa</td>
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<td>Irene Jones</td>
<td>B. Sc., Manchester, Iowa</td>
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<td>Axel Kolling</td>
<td>B. V. M., Hawkeye, Iowa</td>
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<tr>
<td>Fred R. Lowery</td>
<td>B. Sc., B. M. E., 1315 W 26th St., Des Moines, Ia.</td>
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<td>Kate LaRue</td>
<td>B. L., Van Horn, Iowa</td>
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<td>Fred N. Lewis</td>
<td>B. C. E., Y. M. C. A. Bldg., Minneapolis, Minn.</td>
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<td>Edward E. Little</td>
<td>B. Ag., Ames, Iowa</td>
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<td>John B. Love</td>
<td>B. Ag., Everett, Washington</td>
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<td>C. J. McCusker</td>
<td>B. Sc., Portland, Oregon</td>
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<td>Willis McKay</td>
<td>B. Sc., New York, New York.</td>
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<td>Pearl (McWilliams) Stelzel</td>
<td>B Sc, Waterloo, Iowa</td>
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<tr>
<td>W. H. Meek</td>
<td>B. Sc., Scranton, Iowa</td>
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<tr>
<td>Rovell Meeker</td>
<td>B. Sc., No 5 W 125th St., New York City, N. Y.</td>
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</tr>
<tr>
<td>Roger C. Mills</td>
<td>B. Ag., Alta, Iowa</td>
<td></td>
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</tbody>
</table>
LIST OF GRADUATES

David W. Morgan, B. E. E., Albuquerque, New Mex.
George E. Nesom, D. V. M., B. Sc., Clemson College, S. Carolina.
Jessie J. Parker, B. Sc., Ames, Iowa.
*A. J. Perrin, B. C. E.,
Eugene D. Perry, B. Sc., 605 Ia. Loan & Trust Bldg., Des Moines, Iowa.

Ellison G. Preston, B. Ag., Des Moines, Iowa.
Elizabeth (Read) Cohn, B. L., Ames, Iowa.
Alice E. Reed, B. L., Monticello, Iowa.
O. W. Rowe, D. V. M., Utica, Iowa.
Stella M. Russell, B. L., Storm Lake, Iowa.
Joseph Harry Scurr, B. Ag., Gilman, Iowa.
Dollie M. (Snelson) Hogan, B. Sc., Massena, Iowa.
Frank C. Stetzel, B. Sc., Waterloo, Iowa.
C. T. Stevens, B. Sc., Alden, Iowa.
Mabelle T. Stewart, B L., Boone, Iowa.
Simon W. Tarr, B. C. E., Duluth, Minnesota.
Margaret M. Taylor, B. L., Olin, Iowa.
Wm. C. Tilden, B Sc., Stanwood, Iowa.
Annie M. (Walker) Kingsbery, B Sc., Osage, Iowa.
Wm W. Warden, B. Ag., Van Cleve, Iowa.
Lorena Webber, B Sc., Renwick, Iowa.
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