WASHINGTON AGRICULTURAL COLLEGE

AND

School of Science.

1894-95.
FOURTH ANNUAL CATALOGUE

OF THE

WASHINGTON AGRICULTURAL COLLEGE,
EXPERIMENT STATION
AND SCHOOL OF SCIENCE,

PULLMAN, WASHINGTON.

1894-95.

OLYMPIA, WASH.:
O. C. WHITE, .. STATE PRINTER.
1895.
### GENERAL CALENDAR

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COLLEGE CALENDAR.

1895.
September 25-26, Wednesday and Thursday — Entrance Examinations.
September 26, Thursday — College year begins.
November 28, Thursday — Thanksgiving day; a holiday.
December 20, 1895, to January 2, 1896 — Christmas holidays.

1896.
February 10 to 15 — Mid-year Examinations.
February 16 — Second Semester begins.
February 22 — Washington's birthday; a holiday.
March 25 to 29, inclusive — Spring vacation.
May 30 — Memorial day; a holiday.
June 25 — Commencement day.
BOARD OF REGENTS.

His Excellency John H. McGraw, ... Olympia.

T. R. Tannatt, ... Farmington.

E. S. Ingraham, ... Seattle.

J. W. Stearns, ... Tekoa.

H. S. Blandford, ... Walla Walla.

J. W. Arrasmith, ... Colfax.

Enoch A. Bryan, ... Pullman.

Secretary, Ex-officio.

Regular meetings of the Board are held on third Monday of each month.

ORGANIZATION OF THE BOARD.

T. R. Tannatt, ... President.

E. S. Ingraham, ... Vice President.

J. W. Stearns, ... Treasurer.

Enoch A. Bryan, ... Secretary.
FACULTY.

Enoch A. Bryan, A. M., President,
Professor of History and Political Science.

Nancy L. Van Doren, Preceptress,
Professor of English Language and Literature, and Librarian.

Charles V. Piper, M. S., Secretary of the Faculty,
Professor of Botany and Zoology.

George H. Watt, B. S.,
Principal of the Preparatory Department.

Addison R. Saunders, M. E.,
Professor of Mechanical Engineering and Physics.

Osmar L. Waller, Ph. M.,
Professor of Mathematics and Civil Engineering.

Elton Fulmer, M. A.,
Professor of Chemistry.

George E. Stockle, Second Lieut. 10th Cav., U. S. A.,
Professor of Military Science and Tactics.

William J. Spillman, M. S.,
Professor of Agriculture.
WASHINGTON AGRICULTURAL COLLEGE.

Annie Howard,
Professor of Rhetoric and Composition.

John A. Balmer,
Professor of Horticulture.

Fred T. Dow, M. E.,

Clarence C. Fletcher, B. S.,
Assistant Chemist.

S. B. Nelson, D. V. M.,
Professor of Veterinary Science.

*Professor of Modern Languages.

*Assistant Professor of Mathematics.

*Instructor in Commercial Branches.

Peter Brown,
Tutor in Preparatory Department.

*To be filled before the beginning of the next term.

NOTE.—Order of Faculty according to seniority of appointment.
## ENROLLMENT.

### Junior Class.

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<tr>
<th>NAME</th>
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<th>RESIDENCE</th>
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<tbody>
<tr>
<td>Hardwick, Emma J.</td>
<td>Bot.</td>
<td>Pullman</td>
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<td>Stratton, Orin Hector,</td>
<td>Civ. Eng.</td>
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### Sophomore Class.

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<th>NAME</th>
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<tr>
<td>Dunham, Fred Charles</td>
<td>Chem.</td>
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<td>Hungate, Jessie E.</td>
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<td>Pullman.</td>
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<td>Johnson, Mary Corinne</td>
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<td>Pullman.</td>
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<td>Kimel, Edward</td>
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### Freshman Class.

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<td>Busbey, Cleo</td>
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<td>Downs, Ollie</td>
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<td>Guy.</td>
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<td>Ellis, Anna M.</td>
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<td>Knight, Marie</td>
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<td>Palouse.</td>
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### Washington Agricultural College

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<td>McCroskey, Virgil T.</td>
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<td>Colfax</td>
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<td>Moys, Katie</td>
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<td>Pullman</td>
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<td>Neighbor, Thomas E.</td>
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<td>Philips, Ada Belle</td>
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<td>Philips, William Harbison</td>
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<td>Savage, Walter M.</td>
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<td>North Yakima</td>
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<td>Wallace, Leslie</td>
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<td>Guy</td>
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<td>Wakefield, Charles Lester</td>
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<td>Wood, Julia Lucy</td>
<td>Eng.</td>
<td>Edwardsville, Ill</td>
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**Special.**

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<td>Henley, Charles Peyton</td>
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<td>Saul, William</td>
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<td>Spillman, Mattie Ramsay</td>
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**Senior Preparatory Class.**

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<td>Campbell, Benjamin Franklin</td>
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<td>Cloud, Fred D.</td>
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<td>Cooper, Elnore Jane</td>
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<td>Cooper, Wells Calvin</td>
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# Fourth Annual Catalogue.

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<td>Hill, Minnie Myrtle</td>
<td>Eng.</td>
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<tr>
<td>Hubbard, John Dewey</td>
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<td>Hungate, James William</td>
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<td>Kruegel, Nellie C.</td>
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<td>Lake, Cora Belle</td>
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<td>Lanning, Elva Myrtle</td>
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<td>Lobaugh, Dora Orlette</td>
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<td>McKay, William J.</td>
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<td>McMeekin, Edward A.</td>
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<td>Peterson, Hannah Marie</td>
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<td>Smith, Ina Belle</td>
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<td>Smith, Leslie Jerome</td>
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<td>Stratton, Amanda Myrtle</td>
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<tr>
<td>Vaughan, Huldah</td>
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**Junior Preparatory Class.**

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<tr>
<td>Abrams, William Ellis</td>
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<td>Allen, Carrie Eula</td>
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<td>Allen, Della Christine</td>
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<td>Anderson, Robert</td>
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<td>Busbey, Daisy</td>
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<td>Name</td>
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<td>Burke, Frank</td>
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<td>Campbell, William Craft</td>
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<td>CartlIch, Benson</td>
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<td>Climer, Blanche Lillian</td>
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<td>Clowe, Clara Isabel</td>
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<td>Cromwell, Howard Peter</td>
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<td>Crow, Denton Mendenhall</td>
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<td>Duncan, William Martin</td>
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<td>Enghorn, Frank Joseph</td>
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<td>Farnsworth, Jessie</td>
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<td>Jeffries, Curtis</td>
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<td>Lemon, William Livingstone</td>
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<td>Letterman, Abbie Eva</td>
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<td>Lobaugh, Alice Gertrude</td>
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<td>Miller, Henry Atanson</td>
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<td>Morgan, Charles W.</td>
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<td>Morgan, Otis A.</td>
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### NAME

- Myers, Zoe Lela, .................................................. Pullman.
- Nowlin, Louis Sherman, ......................................... Winona.
- Oberst, Christian James, ........................................ Oakesdale.
- Pankey, Walter Winniford, ...................................... Harvey.
- Payne, Walter, ....................................................... Pullman.
- Peterson, Charles John, ........................................... Pullman.
- Pickell, Stella Belle, ................................................. Pullman.
- Poe, Jennie, ........................................................... Palouse.
- Pohle, Louis Herman, ................................................. Dayton.
- Porak, Rudolph, .................................................... Sprague.
- Smith, Albert Lee, .................................................. Steptoe.
- Storer, Albert Wallace, ............................................ Spokane.
- St. Lawrence, Loren, ................................................. Pullman.
- Taylor, Ada, ........................................................... Pullman.
- Taylor, Phoebe Bloom, .............................................. Pullman.
- Taylor, Charles Simpson, .......................................... Pullman.
- Totten, Leo Lucian, ................................................ Steptoe.
- True, Harry Elmer, ................................................ Pullman.
- True, Fred Calvin, ................................................ Pullman.
- Webb, William Walter, ............................................. Pullman.
- Winston, Joseph Byrd, ............................................. Spokane.
- Wright, Ruth, ........................................................ Guy.
- Yeo, Nellie May, ..................................................... Pullman.
- Yoe, Esther Grace, ................................................ Pullman.

### Residence

- Pullman.
- Winona.
- Oakesdale.
- Harvey.
- Pullman.
- Pullman.
- Pullman.
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- Pullman.

### Special Students

- Barnes, Clara, ....................................................... Pullman.
- Bedtelyon, George, ................................................. Egypt.
- Boozer, Rosa Josephine, .......................................... Rosalia.
- Bradford, James, ................................................... Dayton.
- Bryson, Odell V., ................................................... Garfield.
- Cope, Alice, ......................................................... Coulee City.
- Ginger, John Wallace, ............................................. Garfield.
- Green, Robert Livingstone, ..................................... Harrington.
- Hardwick, Thomas J., .............................................. Pullman.
- Harris, Lewis, ........................................................ Pullman.
- Isaacs, John Philips, .............................................. Walla Walla.
### Name

<table>
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<tr>
<td>Knapp, Cora Hester</td>
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<td>Winniford, Marguerite E.</td>
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### Summary

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<td>Juniors</td>
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<tr>
<td>Sophomores</td>
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<tr>
<td>Freshmen</td>
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<td>Senior Preparatory</td>
<td>39</td>
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<td>Junior Preparatory</td>
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<td>Special</td>
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<td><strong>Total</strong></td>
<td><strong>186</strong></td>
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The following counties of Washington were represented:

- Asotin
- Lewis
- Snohomish
- Columbia
- Lincoln
- Walla Walla
- Douglas
- Spokane
- Whatcom
- Garfield
- Stevens
- Yakima

In the winter school for farmers there was an enrollment of 304, representing ten counties.
CADET ROSTER, 1895.

MAJOR OF CADET BATTALION,
G. E. STOCKLE, SECOND LIEUT. TENTH CAVALRY, U. S. A.

Adjutant—First Lieut. Stanley B. Long.
Quartermaster—First Lieut. O. R. Stratton.
Sergeant Major—Floyd Moore.

COMPANY A.

Captain—F. A. Boozer.
First Lieut.—Carl Estby.
Second Lieut.—Thomas E. Neighbor.
First Sergeant—George Nixon.
Corporals—S. Van Doren, E. A. McMeekin, W. E. Steinweg, H.
J. Doolittle.
Musician—Chas. Harlowe.

COMPANY B.

Captain—Frank M. Lowden.
First Lieut.—Peter Brown.
Second Lieut.—H. K. Burch.
First Sergeant—W. L. Lemon.
Sergeants—Edw. Kimel and J. E. Clemens.
Musician—R. A. Porak.
THE WASHINGTON AGRICULTURAL COLLEGE
AND SCHOOL OF SCIENCE.

LOCATION.

The College is beautifully situated on an elevation directly
east of and overlooking the young, flourishing town of Pull-
man, in Whitman county.

Its location in the midst of the famous Palouse Valley gives
it unusual advantages for agricultural and horticultural ex-
perimentation, while its nearness to the great Snake river or-
chards affords additional facilities to horticultural students.

Pullman is supplied with numerous artesian wells of pure
water, has a high, healthful location, and has an intellectual
and enterprising population of fifteen hundred people. There
are five churches, a fine large public school building, and a
commodious auditorium. Persons wishing to move to a col-
lege town to educate their children will find it a very desira-
ble place to live in. It is readily accessible from different
parts of the state by both the O. R. & N. and Northern Pa-
cific railroads. The railway stations being less than a mile
from the College renders it an easy matter to reach the Col-
lege or visit the experimental farm connected with it.

ORIGIN AND DESIGN.

The Agricultural College, Experiment Station and School
of Science of the State of Washington is one of the institu-
tions founded in pursuance of the design of congress in the
act of July 2, 1862, and supplemental acts for the establish-
ment of colleges of agriculture and the mechanic arts. The
general purpose of these acts was to promote industrial de-
velopment by affording it the best results of modern science and scientific methods of investigation. It was intended that the useful should be aimed at in education rather than the ornamental. Collegiate instruction was thus provided in the sciences upon which agriculture and the mechanic arts are based, and the study of the economic side of these subjects was to be supplemented by the practical illustration of the corresponding arts. Two separate laws have been enacted by the State of Washington with a view to carrying out the intention of the national legislation. The first act was that of March 28, 1890, by which a commission was created to establish a state college. The purpose in view is clearly expressed in this act:

"SEC. 3. That it shall be the object and duty of the commission to further the application of the principles of physical science to industrial pursuits, and in particular to collect information as to schemes of technical instruction adopted in other parts of the United States and in foreign countries; to hold farmers' institutes at such times and places and under such regulations as it may determine, and to perform such other duties as may from time to time be prescribed by law, and said commission shall possess all the powers necessary or convenient to accomplish the objects and perform the duties prescribed by law.

* * * * * * * * *

"SEC. 6. That the object of said College shall be to train teachers of physical science, and thereby further the application of the principles of physical science to industrial pursuits.

* * * * * * * * *

"SEC. 8. That the said commission shall make provisions that all instructions given in the College shall, to the utmost practicable extent, be conveyed by means of practical work in the laboratory. Said commission shall provide, in connection with said College, the following laboratories: One physical laboratory or more, one chemical laboratory or more, and one biological laboratory or more, and suitably furnish and equip the same. Said commission shall provide that all male students shall be trained in military tactics.
Said commission shall * * * provide instruction in the following subjects: First, Physics, with special application of its principles to agriculture; second, chemistry, with special application of its principles to agriculture; third, morphology and physiology of plants, with a special reference to the commonly grown crops and their fungus enemies; fourth, morphology and physiology of the lower forms of animal life, with a special reference to insect pests; fifth, morphology and physiology of the higher forms of animal life, and in particular the horse, cow, sheep and swine; sixth, agriculture, with special reference to the breeding and feeding of live stock and the best modes of cultivation of farm produce; seventh, mining and metallurgy.”  * * *

This commission did not succeed in locating and establishing the College, but the section just quoted was not repealed by the next legislature, which, in 1891, passed an act accepting the grants made by congress and establishing an institution of learning in conformity therewith. Section 2 of this last act declares:

“The Agricultural College, Experiment Station and School of Science created and established by this act shall be an institution of learning open to the children of all the residents of this state and to such other persons as the Board of Regents may determine.  * * * Shall be non-sectarian in character, and devoted to practical instruction in agriculture, mechanic arts, natural sciences connected therewith, as well as a thorough course of instruction in all branches of learning bearing upon agriculture and other industrial pursuits.”

Section 3 of this act further indicates the scope and purpose of the College as follows:

“The course of instruction of the Agricultural College, Experiment Station and School of Science shall embrace the English Language, Literature, Mathematics, Philosophy, Civil and Mechanical Engineering, Chemistry, Animal and Vegetable Anatomy and Physiology, the Veterinary Art, Entomology, Geology, and Political, Rural and Household Economy, Horticulture, Moral Philosophy, History, Mechanics, and such other sciences and courses of instruc-
tion as shall be prescribed by the regents of this institution of learning."

The national legislation making donations of land and money for agricultural colleges is equally indicative of an intention to provide facilities for specific lines of study, and these lines are such as bear directly on the industrial development of the community, and at the same time afford a broad culture. Evidently the object has been to furnish a practical and liberal education, and at the same time to inculcate a proper sense of the dignity of industrial pursuits, the duties and privileges of citizenship, and the great importance of applying to the various industries of life the best scientific information. It is therefore the object of the faculty of this institution to assist all who pursue its courses of study to obtain such an education as will enable them to apprehend their high destiny, to develop all their faculties of body, mind and soul, and to carry away with them such an inspiration as will insure a life of honest and earnest service in some useful field of labor. The facilities necessary to carry out the full design of the institution are expensive, and cannot all be obtained at the outset. It is certainly a wise policy of the legislature not to sell the magnificent land grant until it reaches a higher valuation. In the meantime the institution has a liberal income from other sources.

ENDOWMENT.

The funds of the institution are derivable from the following sources:

(a) State appropriations.
(b) United States law of March 2, 1887, known as the Hatch fund.
(c) United States law of August 30, 1890, known as the Morrill fund.
(d) Tuition from students outside of the state.
(e) Receipts of moneys from the sale of products of the farm and experiment station.

(f) Forfeitures of deposits by students for damages to furniture, etc.

THE HATCH FUND.

The law of March 2, 1887, established experiment stations in connection with agricultural colleges in the different states, and made an annual appropriation for the purpose of "paying the necessary expenses of conducting investigations of experiments and printing and distributing the results." It also requires bulletins, or reports of progress, to be published at said stations at least once in three months, one copy of which shall be sent to each newspaper in the state, and to such farmers as may request the same.

The purpose of the act, as set forth in section 2, is as follows:

"Sec. 2. That it shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals; the disease to which they are severally subject, with the remedies for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural or artificial, with experiments designed to test their comparative effects on crops of different kinds; the adaptation and value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective states or territories."

THE MORRILL FUND.

This is established by the act of August 30, 1890. The object of this fund is a more complete endowment and sup-
port of the colleges for the benefit of agriculture and the mechanic arts. It is paid annually, on or before the 31st day of July, to such officers as shall be designated by the laws of the state to receive the same, who shall, on the order of the Regents, immediately pay the same over to the treasurer of the board. The fund is $21,000 for the fiscal year ending June 30, 1895, and increases $1,000 each year until it reaches $25,000, when it thereafter remains stationary.

GRANTS OF LAND.

The United States has endowed the Agricultural College with 90,000 acres of land, and the School of Science with 100,000 acres. None of these lands have as yet been sold and converted into funds for the use of the institution. Less than half of each amount donated has been selected and appraised, and the valuation of that which has been appraised, 74,500 acres, amounts to nearly one million dollars. When these lands shall have been sold the moneys arising from such sales will constitute a fund for the endowment, support and maintenance of the College, and will be a permanent and irreducible fund, except that a sum not exceeding ten per cent. upon the amount received may be expended for the purchase of lands, for sites and experimental farms, whenever authorized by the legislature, but no portion of the 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.

STATE APPROPRIATIONS AND FUNDS.

The legislature of 1895 appropriated the following:

- For maintenance .................................................. $25,000 00
- For deficiencies (about) ........................................ 25,000 00
- For girls' dormitory ........................................... 20,000 00
- For dairy, piggery and granary ............................... 4,000 00
For land in front of and south of campus.............................. $4,000 00
For Puyallup station .......................................................... 2,500 00
For heat, light and power plant........................................... 7,500 00
For furnishing administration building and connecting
with steam plant............................................................... 6,000 00
For further experimentation with sugar beets.......................... 1,500 00

MATERIAL EQUIPMENT.

THE BUILDINGS.

The Administration Building.—This building is now com-
pleted and has been occupied the latter part of the present
year. Its extreme measurements are 156 by 89 feet. It is a
beautiful four-story structure, substantially built of Spokane
granite and pressed brick. The basement floor affords com-
modious quarters for the chemical and physical laboratories,
the former being large enough to accommodate from sixty to
seventy students in analytical work. The fourth floor has
been fitted up for the reception of the museum. On the sec-
ond and third floors are the offices, the library, class rooms,
and a large assembly room.

College Hall.—This is a three-story frame building, con-
taining fourteen rooms. It has been used during the past year
for laboratories, recitation rooms and offices. It will be used
for some of the experiment station laboratories during the
coming year, particularly the biological and agricultural
laboratories.

Mechanical Hall.—This building was completed during the
past year, and contains class rooms, mechanical engineering
laboratories and machinery room. It is 78 by 92 feet. A fuller
description of its construction and use is given elsewhere.

The College Dormitory.—This is a brick structure, one
hundred and four feet in length, with a frontage of fifty-seven
feet. It is heated by steam and lighted by electricity. In the
basement is a large and commodious dining hall, a complete kitchen with pantries, china closets and cold storage room. The four other stories are devoted to dormitory purposes, and will accommodate one hundred and thirty students with comfortable study and sleeping rooms.

*The Gymnasium and Armory.*—The building formerly used for the shops has been converted into a gymnasium and armory. The room is 28x60 feet, and has bath rooms connected with it. The intention is to supply the room with the paraphernalia necessary for a complete gymnasium. In another part of the same building the boilers are placed. The engine room is furnished with a 25-horse-power Atlas engine and a dynamo, which are used for experimental purposes and are also used for lighting the College buildings. During the summer a new building will be erected for the heat, light and power plant and the room now used for that purpose will be devoted to the forge work.

*The "Crib."*—The first building erected for college purposes, which has received the sobriquet "the crib" (presumably because it was the home of the infant institution), is a brick structure 36x60 feet, containing five rooms. At present it contains the museum and working laboratories of the biological department.

*The Greenhouse.*—A small forcing house was built some time since. It being totally inadequate to the needs of the departments of horticulture, botany and agriculture, a new greenhouse of the most approved construction was built during the last summer and fall. The main body of the building is 100x16 feet, and at the end is a potting shed 16x30 feet. The old forcing house is made a part of the structure, and a cold frame 100x6 feet is attached. The heating, lighting and
ventilating of the greenhouse is in accordance with the most approved ideas on the subject.

The Farmhouse, Barns, etc.—These adjuncts to the experiment station are located on the station farm. The barn, neither in size nor arrangement, is adequate to the needs of the station. Adjoined to it is a root house from which the roots used for feeding purposes may be conveniently taken. A double silo was constructed during the past season, and forms an important adjunct to the barn.

NEW BUILDINGS.

Girls' Dormitory.—During the coming summer it is proposed to erect a girls' dormitory, and an appropriation of twenty thousand dollars was made for that purpose by the last legislature. The plans adopted are for a building that will accommodate about sixty young women. A beautiful building in the old colonial style, the extreme measurements of which are about 100 x 130 feet, will afford an attractive home to the future female students of the institution. It has broad porches, and the upper porch will in winter be enclosed with glazed sash, thus affording an opportunity for exercise in the sunlight without the inclemency of the weather. The spacious dining rooms, parlors, music room, romping room, etc., are designed to make it an attractive as well as healthful home for the students. The arrangement of study and bed rooms embodies the latest and best ideas in this kind of architecture.

Heat, Light and Power Plant.—This will be a model of its kind, both as regards the building and its contents. It is designed as a means for the instruction of the engineering students as well as a source of supply for heat, light and power.
Dairy Plant.—The building and its contents are intended to be similar to the best modern dairies designed for practical work. The larger room necessary when students are to be instructed is provided for without any interference with economical arrangement.

The Piggery.—This is also designed to serve as a model building for the purpose as well as to provide for the experimental stock.

The Experiment Station Farm.

The farm consists of two hundred acres, all of which is in cultivation. It lies directly east and adjoining the horticultural grounds and campus. It contains every variety of the Palouse country soil and is well adapted to purposes of experimentation. The soil is the deep, rich, loose soil, composed of decomposed basalt, such as is found throughout this section of Washington.

About fifty acres have been subdivided into small plats on which experiments are being carried on with all kinds of farm crops. Thirty acres more have been seeded down to permanent pastures of alfalfa, timothy and mammoth clover, orchard grass and red clover, and various mixtures of perennial grasses.

The remainder of the farm is divided into five fields, upon which a five year rotation has been started as follows:

*First year:* Grain (wheat and oats).
*Second year:* Fodder crops (corn, sorghum, Loy bean, etc.).
*Third year:* Hay crops (clovers and grasses).
*Fourth year:* Hay crops (clovers and grasses).
*Fifth year:* Roots, peas, and peas and oats.

The farm is supplied with barn, cow stable, piggery, a sixty-five ton silo, root house, granary and creamery. In addition to the usual farm machinery are large weigh scales,
steam engine, grist mill, ensilage cutter, and separator. The latter was presented to the station by the manufacturers, Messrs. Aultman, Taylor & Co., Akron, Ohio.

The following breeds of stock are represented by typical animals: Jersey, Shorthorn, and Holstein-Fresian cattle, and Berkshire swine. Poland China swine are to be purchased shortly. It is the intention to stock the farm with milch cows, hogs and sheep, all of the best individual merit and breeding. As soon as they can be gotten together a herd of twenty dairy cows will be maintained.

The campus contains about thirty acres, situated directly west of the College farm and adjoining the city limits of Pullman. It is finely located, and affords an excellent opportunity for horticultural instruction while it is being beautified.

An arboretum has been begun, and the nursery already furnishes a very considerable stock from which it can be supplied.

About ten acres are in orchard, in which a choice collection of fruit trees has been planted.

THE LIBRARY.

The library and reading room have been located in a convenient and well lighted room in the Administration Building, where it will remain until such time as a suitable fireproof building is provided for it. In size the room is entirely inadequate to the demands of the students.

The library contains 3,328 bound volumes, and the collection of pamphlets is 1,219. The selection of literary works is a typical one, and represents the best in the various kinds of English literature.

Students have free access to the book shelves, and under certain regulations books may be drawn for use at their rooms.
The College has been designated as the depository of government documents, of which the library has already received 935 volumes, including the most important scientific publications of the government. It has a complete set of the agricultural reports.


Grateful acknowledgments for free subscriptions are made to the publishers of the following:


**Horticultural and Agricultural Papers**: Maryland Farmer, Canadian Kennel Gazette, Canadian Horticulturist, Ohio


Besides the general library, there are well selected departmental libraries; also the experiment station library to which students have access. The reading room and library have been well used by the students.

THE LABORATORIES.

The Chemical Laboratory, which occupies half of the first floor of the administration building. It consists of the chemist’s office, private working laboratories, store room, weighing room, assay room, dark room, and a large room with desks
and apparatus for the accommodation of seventy or eighty students in analytical work.

The Biological Laboratory is supplied with an outfit for botanical and zoological study and experimentation. Larger quarters are needed for this important field of work.

The Physical Laboratory is located in the new building, and is well supplied with apparatus for laboratory work.

The Mechanical Laboratories.—These are described in detail elsewhere in this catalogue.

The Historical Laboratory.—A mere beginning has been made in equipping an historical laboratory. It is hoped in time to have this laboratory supplied with a large equipment.

METEOROLOGICAL EQUIPMENT.

This consists of a mercurial barometer, maximum and minimum thermometer, rain gauges and wind vanes. It is the intention of the College authorities to enlarge this department and to make it more serviceable to the people of the locality and the entire state. A room has been provided in the new building for the use of this department, and the apparatus will be increased at an early date.

THE MUSEUM.

300 specimens of minerals, mainly from the United States, New South Wales, Germany and Mexico.

250 specimens of Washington state ores. This is a very complete set of the gold, silver, coal and iron ores of the state.

150 specimens of North American woods, including a very complete set of those native to the state.

50 mounted specimens of Washington birds.

1 pair mounted black bears.

1 family of three black-tailed deer, mounted.

1 deer, mounted, a partial albino.

1 spotted seal.

1 racoon.
Several small mammals, mounted.
40 mounted specimens of Washington fish.
2 jars of fish in alcohol.
8 jars mollusks.
1 live male elk.
The lower jaws of a Pacific hump-back whale, from Willapa Harbor.
Also, seven fine exhibition cases in which these specimens were displayed.
1 Indian canoe.
1 model of Columbia river fishing boat.

Thanks are due to many persons for this collection, but special mention should be made of the members of the commission and of Regent Chas. R. Conner.

Other donations to the museum have been as follows:
From J. B. Reavis—One mounted head of white-tailed deer.
From John Hudson, South Bend—One mounted male elk.
From Frank Lee—Section of an apple tree, one foot in diameter. Several Indian arrow heads.
From D. R. Good, Tekoa—One whistling swan, mounted.
From H. H. Pond, Tekoa—One live golden eagle.
From National Museum—Set alcoholic specimens of invertebrates. Collection of minerals.

The museum forms an attractive collection, and one which places greatly increased facilities for study at the disposal of the students of science. A great benefit may be conferred upon science students and upon this state institution by adding to the museum other valuable specimens. The friends of the institution are invited to make gifts to the museum; such gifts will be suitably acknowledged.
COURSES OF INSTRUCTION.

The following departments have been organized and courses of instruction are offered in each:

I. Department of Mathematics and Civil Engineering, including—(a) Course in Mathematics; (b) Course in Civil Engineering; (c) Course in Mining Engineering.

II. Department of Chemistry.

III. Department of Botany and Zoology.

IV. Department of Agriculture.

V. Department of Horticulture.

VI. Department of English Language and Literature.

VII. Department of Economic Science and History.

VIII. Department of Mechanical Engineering, including—(a) Course in Mill Engineering; (b) Course in Electrical Engineering; (c) Course in Steam Engineering; (d) Course in Hydraulic Engineering.

IX. Department of Military Science and Tactics.

Courses of instruction supplemental to the work of the above departments are also offered in German, French, Latin and Physics.

In general, students will be expected to choose the work of one of these departments (other than IX) as his major subject. In the less technical courses as large an opportunity as possible will be given for elective work, particularly in the junior and senior years.
The courses offered by this department have in view a preparation in applied rather than in pure Mathematics. The methods pursued in the mathematical studies are intended to render the student capable of using them as tools in the various engineering courses. Additional courses in pure Mathematics will be offered hereafter.

(a) COURSE IN MATHEMATICS.

1. Solid Geometry and Conic Sections. In order to make the student familiar with applied Geometry the theoretical work will be supplemented with numerous problems. Wentworth will be used as a text. Required of all students who are applicants for graduation. Daily, first semester.

2. Trigonometry and Surveying. A knowledge of the general trigonometrical formulæ, both plane and spherical, and ability to solve problems rapidly, will be required, the aim being their further application in technical work. The use of the simpler surveying instruments will be taught. Field work will consist of triangulation, chaining, ranging out, compass surveying and leveling. Required of all students who are applicants for graduation. Daily, second semester.

3. Advanced Algebra. The course in higher Algebra will include a review of elementary quadratic equations, series, undetermined coefficients, logarithms, determinants, theory of equations, graphical representation of functions and the solution of more difficult equations. Wells' College Algebra is used as a text. Required of all students of mathematical and engineering courses. This course presupposes the completion of courses one and two. Daily, first semester.

4. Analytical Geometry, with work in Differential Calculus, forms a full course. Loci, the straight line, general equations of the
second degree, higher plane curves, transcendental equations and an introduction to the triplaner system. Olney is used as a text. Required of all Mathematical and Engineering students. Three times a week, second semester.

5. Differential Calculus, with work in Analytics, forms a full course. Required of all Engineering students. Twice a week, second semester.

6. Integral Calculus. Required of all students taking the Engineering courses. Five days in the week, first semester.

(b) COURSE IN CIVIL ENGINEERING.

The course in Civil Engineering will include, in addition to the Mathematics prescribed under "(a)," Surveying, Applied Mechanics, Road and Railroad Construction, Trusses, Arches and Masonry, Bridge Designing, Hydraulics, Irrigation and Sanitary Engineering. The field and office work is designed to give the student a practical application of his mathematical studies and a practical training for the work of a civil engineer.

1. Surveying. The theory of surveying includes the construction, use and adjustment of modern instruments used in field and office work. Areas and distances are determined by chain, compass and plane table. Boundaries re-established. Angles, inaccessible distances, elevations and areas are determined with the transit. The student will solve numerous problems with the level, and make drawings of contours and profiles. Hodgman's text is used; Johnson's will be used for reference. Required of all students in Civil and Mining Engineering courses. Daily, second semester.

2. Road and Railroad Construction and Topographical Surveying. This course is designed to meet the demand for road engineers. It will include economic location, grades, construction of roadbed, drainage and road covering. In addition to this the class will make preliminary and location surveys of a line of railroad. The student will be made familiar with the best practice, each student being required to make a full set of notes, profiles and a topographical map; he will also make estimates of earth work, and learn the mathematical theory of curves and turnouts. Goodwin
is used as a text. Daily, throughout the first semester, and three times a week, second semester.

3. **Analytic Mechanics.**

4. **Roof and Bridge Strains and Bridge Designs.** Considerable time is devoted to the analysis of strains in the different forms of roof and bridge trusses. Both analytic and graphic methods are used. Weight of bridge, wind and snow loads, and moving loads, are considered. Local bridges will be visited, measured and strains determined. Each student will make a full set of drawings of a bridge, compute the strains and proportion its sections. Green is used as a text.

5. **Sanitary Engineering.** This course will include the discussion of the collection, storage and purification of water supply; separate and combined systems of sewers; the purification and disposal of sewage.

6. **Irrigation.** This is intended to follow and supplement the course in hydraulics, and will discuss the construction of dams, the location of canals, the measurement of water, fluming, wiers, the flow of water in open channels, and the gauging of streams. These subjects together constitute a course. Five days in the week, first semester.

7. **Contracts and Specifications.** Two-fifth course.

8. **Astronomy.** Young is used as a text. Five days in the week, second semester.

(c) **COURSE IN MINING ENGINEERING.**

This course will be such a modification of the course in Civil Engineering as to adapt it to the ends in view. It will consist of courses offered by the Civil Engineering, Mechanical Engineering and Chemical departments, and the student is referred to the schedule for the subjects offered. Visits will be made to the neighboring mines and smelters, and the student will be required to spend a part of the summer vacation in mine surveying. The course in Chemistry required of Mining Engineering students will include courses one and two of the Department of Chemistry.

**Facilities.** The department is provided with a technical library which is always open for the use of students. It contains some of
the best texts on road and railroad construction, arches, roofs and bridges, hydraulics, water supply, sewage disposal, irrigation engineering, etc. The college is well supplied with instruments. The classes in surveying will be furnished with a fine Gurley transit, with solar attachment, a twenty-two inch wye level, a plane table, engineer’s chains, a Philadelphia rod, steel tape, surveyor’s chains, clinometer, compass, polar planimeter, range poles, mining transit, and a Buff & Berger tachymeter. It is believed that with this equipment the student may become thoroughly familiar with the use of instruments.

Drawing, Engineering Mechanics, Foundations, and Mining and Hydromechanics, in both Civil and Mining Engineering, same as in course 8, q. v.

II.—DEPARTMENT OF CHEMISTRY.

ELTON FULMER, PROFESSOR.

The courses of instruction offered in this department are designed to prepare students for practical work in this branch of science, either as teachers of chemistry, experiment station chemists, or general analytical or manufacturing chemists. While instruction is given with this very practical object in view, yet special care is taken to make the student something more than a mechanical analyst or skillful manipulator. An effort is made to combine both the practical and the theoretical sides of the subject in such a manner that the different operations conducted by the student will be performed with a clear understanding of the principles involved.

The work of this department is carried on by means of illustrated lectures, recitations and laboratory work. In the laboratory the student studies substances instead of books, and determines properties for himself. When he enters the laboratory he receives a sheet of instructions which are at once explanatory, suggestive and interrogatory. A daily written report of work performed is required of each student. The lectures and laboratory work sup-
plement each other, the latter being especially designed to illustrate theories or principles discussed in the former, or to work out problems that are there suggested.

1. **General Experimental Chemistry.** This includes a study of the non-metallic and metallic elements and their most important compounds, and is directed mainly to the fundamental and general principles of the science. Special attention is given to those elements and compounds which have a commercial importance; to the writing of reactions, and their real significance; and to the principles of stoichiometry or chemical arithmetic. This course is preeminently adapted to the development of the powers of observation and of the ability to draw correct conclusions from observed facts. Three lectures and six hours of laboratory work per week throughout the year.

2. **Qualitative Analysis.** This course includes a thorough study of the characteristic properties and reactions of the metals and the general principles underlying qualitative analysis. By means of this systematic study, the student will be enabled not only to detect the presence of the acid and basic constituents of unknown substances, but also to separate them from each other. The analysis of a given number of unknown substances will be required. In this course, also, some attention will be given to the purification of chemicals by sublimation and crystallization. Two lectures and four hours of laboratory work per week throughout the year. Course 1 must have been completed.

3. **Elementary Chemical Philosophy.** This course is supplementary to and coordinate with course 2. It will include a brief study of the fundamental principles underlying Chemistry. Subjects such as the following will be considered: Atomic theory, Avogadro's law, specific heat, valence, periodic law, structure of compounds, basicity, vapor density, etc. One lecture per week throughout the year; must be preceded by course 1.

4. **Quantitative Analysis.** This course consists of lectures on the methods of analysis, both of gravimetric and volumetric work. In the laboratory the student begins his work with the analysis of substances of known percentage composition, and after having attained sufficient skill and accuracy in method and manipulation he will take up the determination of substances of unknown composi-
tion. Two lectures and twelve hours of laboratory work per week throughout the year; must be preceded by courses 1 and 2.

5. This course is especially designed to meet the needs of students in the engineering departments, who will take it during their senior year: The first semester will be devoted to general chemistry of the metals and non-metals, while the second semester will be given up to work in chemical technology as applied to subjects connected with practical engineering. The following, and similar topics will be considered: Effect of gases of combustion upon materials, chemistry of boiler waters, lubricating oils, fuels, mortars and cements, alloys, preservatives of wood and metal. Two lectures and six hours laboratory work per week throughout the year.

6. Historical Chemistry. This will consist of a course of lectures on the early history and subsequent development of chemical science, special attention being devoted to the work performed by eminent chemists. Two lectures per week throughout first semester.

7. Organic Chemistry. This will consist of a brief study of the principles of organic chemistry, and the preparation of the simpler and more important organic compounds. Remsen's Organic Chemistry will be used as a basis of this work. Two lectures and four hours of laboratory work per week throughout the year; must be preceded by courses 1 and 2, and preceded by or concordant with courses 4 or 9.

8. Photography. The chemical principles involved in photography, directions for using both the tripod and hand camera, and the development and finishing of the picture, will constitute the basis of the lectures in this course. Students taking this work will be required to complete a certain number of satisfactory pictures. One lecture and two hours of laboratory work per week throughout second semester; must be preceded by course 1.

9. Assaying. This course includes lectures on the methods of assaying ores of gold, silver, lead, copper, etc., and students taking the work are given thorough instruction in the manipulation and use of assay furnaces—both coke and gasoline furnaces being used. Instruction is also given in the electrolytic estimation of copper, and in the rapid wet assay of other metals. If desired by a sufficient number of students, this course will be expanded to meet the
requirements of elementary metallurgy. One lecture and five hours' laboratory work per week throughout second semester; must be preceded by course 1.

10. **Agricultural Quantitative Analysis.** This is the same as course 4, with the exception that the class of substances operated upon by the student will have a more direct relation to agriculture. In this course, soils, waters, fodders, fertilizers, etc., will constitute the basis of the analytical work. Two lectures and twelve hours of laboratory work per week throughout the year; must be preceded by courses 1 and 2.

11. **Investigation of Chemical Problems.** In this course the student is expected to take up the original investigation of some important chemical problem presented by existing conditions in the state. The choice of subject is to be optional with the student, but subject to the approval of the head of the department. Fifteen hours of laboratory work per week throughout the year; must be preceded by courses 1, 2, 3, 4 or 9, and 6.

12. **Urinalysis.** One lecture and two hours laboratory work per week throughout one semester; must be preceded by courses 1 and 2.

13. **Toxicology.** One lecture and two hours of laboratory work per week throughout the second semester.

14. **Mineralogy.** Identification of minerals by means of their physical and chemical properties. One lecture and two hours of laboratory work per week throughout first semester; must be preceded by courses 1 and 2.

**GEOLOGY.**

**I. Dynamic, Structural and Historical Geology.** This course will be carried on by means of lectures and textbook work—supplemented, whenever practicable, by field work. Three hours per week throughout first semester.

Text book: Le Conte's Elements of Geology.

**II. Economic Geology.** This course will embrace a study of geology, with special reference to the occurrence of coal, peat, petroleum, and other substances of commercial importance. Two hours per week throughout second semester. An effort will be
made to shape both of these courses to conform to the geological conditions of the state and the northwest.


Facilities. The chemical laboratory is well equipped for the work to be done in this department. The working laboratory for the students is furnished with desks, sinks, reagent bottles, and the usual laboratory furniture and apparatus. Each student is given a desk which contains a large drawer and cupboard, and before beginning work, is supplied with a set of apparatus, consisting of test tubes, beakers, flasks, evaporating dishes, watch glasses, funnels, alcohol lamp, blow pipe, pincers, ring stand, tripod, etc.

For quantitative analysis the laboratory is supplied with one short beam and two long beam analytical balances, and a supply of burettes for volumetric work.

For use in assaying, the department has one Judson’s sectional coke furnace, and one Hoskin’s complete gasoline furnace.

There is also a good equipment for photographic work, consisting of an excellent tripod camera with Dallmeyer’s rectilinear landscape lens, and other things necessary for developing and finishing pictures.

The chemical library, which is accessible to all chemical students, consists of about fifty standard works of reference, including Roscoe & Schorlemmer’s Treatise on Chemistry; Watt’s Dictionary of Chemistry; Crook’s Select Methods of Chemical Analysis; Blair’s Iron Analysis; Hempel’s Gas Analysis, etc.

III.—DEPARTMENT OF BOTANY AND ZOOLOGY.

CHARLES V. PIPER, PROFESSOR.

Two distinct lines of work are offered by this department, namely, Botany and Zoölogy (including Entomology).

The aim of the department is to prepare the student for special work in research and for teaching in whichever science he pursues, but especial attention is always directed to the economic phases of the subjects. In the laboratory, the student works entirely with
the natural objects. This furnishes the basis for lectures and for supplementary readings of the standard and current literature on the subject, to which the student is constantly referred.

(a) Botany. To complete the course in Botany, three years' work in this subject and one year's work during the junior year in Zoology are required. Course 1 is open to all college students, either for one or for both semesters. The remaining courses are open only to students who have completed course 1.

(b) Zoology. The full course in Zoology requires one year's work in Botany and three in Zoology, two of which may be Entomology, the work in Botany to be taken in the junior year. Courses 1 and 5 are open to all college students. The remaining courses must be preceded by course 1.

COURSE IN BOTANY.

1. Elementary Botany. Double course. A study of types of the principal groups of plants. Each student is provided with a compound microscope, a set of reagents and the necessary instruments to prepare sections and slides. The course is a general survey of the plant kingdom, beginning with the simplest forms and leading to the most complex. Careful notes and drawings are made by the student of each plant studied.

The following plants were used during 1894-5: Protococcus, Yeast, Spirogyra, Navicula (diatoms), Closterium (desmid), Vaucheria chara (stonewort), Mucor (mould), Cystopus (rust), Marchantia (liverwort), Atrichum (moss), Pteris (fern), Pinus (pine), Avena (oats), Trillium (lily), Capsella (shepherds' purse). The forms from Protococcus to Marchantia, inclusive, are completed during the first semester; the remainder in the second semester. Three days' laboratory work and two lectures with collateral reading per week.

Laboratory guide, Arthur Barnes and Coulter's "Plant Dissection" mainly.

It is desirable that students taking this course shall have first completed a preparatory course in Botany similar to the one outlined for the preparatory department of the College.

2. Systematic Botany. The Classification of Phanerogams. This includes the principles of classification and their application,
the laws of nomenclature, and taxonomy in general. Lectures and collateral reading. Laboratory work in plant determinations and herbarium studies in special groups. It is desirable that students taking this course give notice the preceding year, and that they prepare collections of plants for themselves. Five days a week, second semester.

3. **Plant Physiology.** A study of living plants, including a study of living protoplasm; of the phenomena of germination and growth; of movements of liquids in plant tissues; the manufacture of plant food and its transportation; respiration metabolism; the movements of plants; variation and heredity. An experimental course mainly with supplementary readings and occasional lectures. Five days in the week, first semester; chemistry 1 required.

4. **Cryptogamic Botany.** An introduction to the morphology and classification of fungi. Special attention will be given to economic forms, the means of controlling them, and methods of tracing life histories. Two hours and a half in the week throughout the year.

5. **Advanced Botany.** Special work will be provided after consultation with the head of the department either in histological or systematic work.

**COURSE IN ZOOLOGY (INCLUDING ENTOMOLOGY).**

1. **Invertebrate Zoology.** The object of this course is to give the student a comprehensive idea of the structure of invertebrates and a wide acquaintance of methods of zoological investigation. The laboratory work consists of a careful study of about ten typical forms, representing the principal groups, with collateral reading in the principal literature.

   In this study the microscope is constantly used, and the simpler microscopical technique and methods of preparing specimens taught.

   With the laboratory work as a basis, lectures will be given on the anatomy, physiology, and the classification of the invertebrates; and also on certain general biological problems. Five days in the week, first semester.

2. **Vertebrate Zoology.** A course in the anatomy, physiology and classification of the vertebrates, similar in a general way to course 1. Five days a week, second semester.
3. Normal Histology. A study of the microscopic structure of the various tissues and organs of the higher animals. Thorough training is given in the various methods of hardening or softening tissues, of imbedding, sectioning, staining and the mounting of permanent specimens, each student preparing his own slides. Five days in the week, first semester. Mainly laboratory work, with lectures.

4. Comparative Embryology. Laboratory work on the development of the frog. Lectures and collateral readings on comparative embryology. Five days a week, second semester.

5. General Entomology. This embraces the anatomical study of typical insects; the characteristics of the more important groups; and especially the economic phase of the subject, including the use of insecticides and the various other means of combating insect pests. Various insects will be followed throughout their transformations in the laboratory, and field work will be given in the practical applications of insecticides. Second semester, five days in the week.

6. Special Entomology. A systematic study of insects in general, the determination of genera and species, and the working out of life histories. Special attention is given to field work and to museum methods in mounting, preserving and forming collections. Three days in the week throughout the year.

7. Special Work. Competent students will be guided in special work in advanced Zoology or Entomology.

Facilities. The laboratory at present will accommodate fifteen students at one time, and is equipped with the following apparatus: 1 Zeiss' microscope, II A, with complete accessories; 15 R. & J. Beck's "Star" microscopes, each with two oculars and 1 inch and ½ inch objectives; 1 Bausch & Lomb laboratory microtome; 1 Bausch & Lomb photo-micrograph; 1 auxanometer; 1 klinostat; 1 set bacteriological apparatus; 1 balance, and various other pieces of apparatus for use in physiological and histological work. Bell jars, moist chambers, dissecting instruments, and an abundance of apparatus for the collection and preservation of plants and animals. Each student is provided with a microscope and a set of reagents, together with all the necessary tools needed in either botanical or
zoological dissections, and in the preparation and mounting of microscopical specimens.

An abundance of preserved material of plants and animals is kept on hand, and fresh botanical material is always to be had from the greenhouse.

**LIBRARY.**

The department has about 100 volumes of standard works of reference, and also files of the principal technical journals. The private library of the head of the department is also accessible to students.

**HERBARIUM.**

The herbarium already contains about 7,000 mounted specimens, and is being rapidly increased. The collection is especially rich in the flowering plants of this state, although the collection of both mosses and fungi are large.

The herbarium is accessible to all students of Botany.

**ENTOMOLOGICAL COLLECTIONS.**

The insect collections are already large, and are being rapidly added to. The entire collection is now being arranged and labeled so as to be readily consulted by students of this subject.

The general zoological collection in the museum is being systematically increased, and already affords excellent opportunities for study.

**ACKNOWLEDGMENTS.**

National Museum — One set plaster casts of prehistoric stone implements.
National Museum — One set alcoholic specimens of marine invertebrates.
National Museum — One set minerals.
Frank Lee — Section of apple tree.
L. C. Read — One stone pestle.
Endicott citizens — One coyote.
George Ritchey — One western goshawk.
J. W. Wilkinson — One golden eagle.
Archie White — One bullsnake.
The purpose of this course is to fit students for intelligent, practical farming; for farm supervision; for investigating agricultural problems; for experiment station work; and for teaching Agriculture. Since this science rests mainly on chemistry, botany and zoology, students in this department are expected to take a large amount of work in these sciences. Instruction in Agriculture will extend throughout the four years, much of which will be by the laboratory method. This will be supplemented by lectures and collateral reading. For the latter purpose, all the standard works on agricultural subjects and the leading agricultural papers are placed in the library for the use of students.

1. **Comparative Anatomy and Physiology.** Preparatory to courses two and four. The horse, cow, sheep and hog are studied with special reference to their normal structure, the adaptability of structure to use, and their nutritive processes. Two lectures and six hours laboratory work per week.

2. **Veterinary Science.** (See Department of Veterinary Science.)

3. **Farm Crops and Principles of Feeding.** The first eight weeks of this course will be devoted to lectures on agricultural plants, their uses, distribution and cultivation. The remainder of the course will consist of three lectures and four hours laboratory work per week in principles of feeding, including composition of feeding stuffs, nature and use of these components, compounding rations, systems of soiling crops, and pastures.

4. **Breeds and Breeding.** A study of the history, characteristics and adaptabilities of the different breeds; the principles of breeding and judging live stock. Two hours each week throughout the semester will be devoted to judging stock, the score card being used until the student is capable of accurate judging. Lectures will also be given on registration of stock. Four lectures per week and two hours judging stock throughout the term.
5. **Agricultural Physics.** The principles of Physics, as applied in agricultural and dairy machinery, the construction and ventilation of farm buildings, construction and management of silos, and as affecting soil moisture. The latter subject will include drainage, irrigation, evaporation and methods of tillage. During the study of machinery, drainage, irrigation, evaporation and methods of tillage, four hours per week are devoted to laboratory work, accompanied by three lectures. Five lectures per week during the remainder of the term.

6. **Dairying.** The care of dairy products on small farms is fully considered; in addition, students are instructed and trained in practical arrangements and business methods of the creamery and cheese factory, the machinery used in the different processes, methods of testing milk, creaming, ripening cream, churning, handling butter, and cheese making. The principal part of the instruction will consist of actual work with these processes. The scientific principles involved in dairying will be treated in lectures two hours per week. Work in dairying and creamery, six hours per week.

7. **Farm Economy.** *One-half course.* Lectures are given on methods of keeping farm accounts, structure of buildings and fences and laws relating to the same; how to market crops and live stock; what is meant by diversified farming; the advantages offered by its various branches, such as grain raising, stock feeding, stock breeding, dairying, poultry raising, apiculture, gardening, etc., and upon the history and development of agriculture, especially in the United States. Five lectures per week during half a term.

**Facilities.** The department is supplied with a laboratory in which dissections, experiments with soils and fertilizers and physiological investigations with plants are conducted. All necessary appliances are provided. For illustrating the breeds of stock, and for practice in judging animals, the fine herds of registered and grade animals on the College farm will be available for the coming year, and free use is made of all stock farms in the neighborhood. A large part of the College farm is devoted to crops and experiments, all of which are freely used by way of illustration of subjects taught. A large barn affords opportunity for practical lessons in stabling and feeding stock. The farm is well supplied with ma-
chinery. The construction and management of these machines forms an important part of the instruction given. As far as possible, students will be allowed to perform the details of experimental work with live stock and farm crops, that they may more thoroughly learn the principles involved, and catch the spirit of investigation and close observation. An extensive and well constructed piggery, a store house for grains and seeds, and a creamery and cheese factory, are now (May, 1895) being added to the equipment of the department, all of which will be ready for use before the opening of the next school year.

SHORT COURSE IN AGRICULTURE.

This course is designed to suit the requirements of those who desire a short but practical course in agriculture and horticulture. Young men who intend to become farmers will find in it the instruction and training that will enable them to apply the best modern principles of agriculture in their farming. The course extends over two years of six months each, beginning with the regular school term in October and running until about April 1. The object of limiting instruction in this course to six months in the year is to enable young men working on the farms to earn sufficient money between terms to carry them through the next term. Anyone of average ability and industrious habits can thus take advantage of the opportunity afforded by this two years course to obtain an education that will be of vast practical value to a farmer.

1. Agriculture. Two years. This will include work in the following subjects: Farm crops, principles of feeding, breeds and breeding, judging live stock, agricultural physics, and farm dairying. The work will consist of lectures, reading and laboratory work. After the student has learned the principles upon which scientific feeding is based, he devotes a portion of each week to compounding actual rations for all kinds of farm stock. He is familiarized with all the best forage plants, their particular value, and methods of cultivation. By using a score card upon which the value of the different points of the animal are marked, students are drilled in judging stock until they become competent judges. The dissemination of such knowledge as this must result in improvement of the live stock of the state. In the work in dairying, students are
trained in the proper handling of milk and in making butter, including the actual use of the Babcock machine, hand separator, Cooley creamer, and butter worker. Physics will be considered especially in its relations to farm machinery, and to soil moisture.

2. **Horticulture. One and one-half years.** The course in this department will consist of lectures, and practical work in horticulture. It will include the art of propagating soft and hard wooded plants; the uses of cold frames, and management of the same; potting, tying, pruning, training, etc., in the greenhouse; management of hot beds, seed sowing in all its phases; soils, and how to mix them for different plants. In orchard, students will be taught how to prune, bud, graft, and manage orchards generally. Lectures will also be given on horticultural economy.

3. **Mathematics. One year.** The work in mathematics will depend on the advancement of the student. He will fall into any of the regular classes in that subject for which he is fitted.

4. **Language. One year.** The same may be said of this as was said of mathematics. The student will enter that one of the regular language classes for which his advancement fits him.

5. **Botany. Twenty-four weeks.** This will include a study of a number of typical flowering plants, especially of those families containing crops, and forage plants, and weeds; enough of the microscopic structure of roots, stems and leaves to enable the student to grasp the fundamental facts in the germination, nutrition and growth of plants; the structure and life histories of the principal fungi causing plant diseases, and the methods of controlling them. Five days in the week.

6. **Chemistry.** The chemistry in this course for the first four months will consist of lectures and laboratory work in general inorganic chemistry. The remaining two months of the year will be devoted to a general study of the chemistry of soils, water, fertilizers and farm products.

7. **Entomology. Six weeks.** The object of this course will be to give the student a good knowledge of the anatomy of some typical insect; of the hard parts, especially the mouth parts, of typical examples of each of the principal orders; of their development, and the metamorphoses which they undergo; of the general principles regarding the use of insecticides as based on the structure of the
insect. The life histories of the principal insect pests will be carefully studied, and the special means of combatting each as based on their habits, the injury, the cause, etc. Considerable time will be given to the preparation of insecticides and the use of spraying machinery. Five days in the week.

8. Dairy School. This course is intended for those actually engaged in dairying. Recognizing that those in charge of creameries and cheese factories cannot spare the time for a lengthy course, we have arranged a course of ten weeks, beginning February 17 and closing April 24, 1895. This will enable those desiring the benefit of instruction in this subject to obtain it at a nominal expenditure of time and money. It is our aim to supply the demand for first-class butter and cheese makers in this and neighboring states. Instruction is offered in the following subjects: Composition of milk and conditions affecting creaming and churning; milk testing, including the Babcock test, lactometer, acid test and rennet test; handling milk; butter making; cheese making; selection and management of dairy cows; feeding; common diseases of dairy cows; care and management of engine, boiler, shafting, pulleys, belts, etc., and methods of keeping accounts at a creamery or cheese factory. A portion of each day will be devoted to work with testers, butter making, cheese making. In order to utilize all the time of students, the instruction and work will occupy six days per week.

V.—DEPARTMENT OF HORTICULTURE.

JOHN A. BALMER, PROFESSOR.

The students of this course will be required to take thorough courses in Botany and Entomology. The aim of this department is to teach the practical application of the sciences to fruit culture, flower culture and gardening. The instruction in this department will be given both by lectures and by practical work in garden, orchard and greenhouse. All students in this department will be required to do the practical work regularly and systematically just
as in the laboratories of other departments, and for this work they will receive no compensation. Of the two methods of instruction, it is intended that the field and greenhouse work shall be the more important.

1. **Greenhouse and Floriculture.** The construction, warming and ventilating of greenhouses will be studied; the manufacture of soils; the potting of plants; propagation; insect pests; habits of growth, etc. The instruction of the lecture room will be supplemented by a practical training in greenhouse manipulation.

2. **Fruitgrowing.** In this course, also, the instruction of the lecture room is combined with work in the field and laboratory. Planting and cultivating of orchard trees and small fruits; methods of propagating; budding and grafting; pruning; location of orchards; fungus and insect pests, and methods of their destruction; harvesting and marketing of fruits.

3. **Gardening—(a) Vegetable Gardening.** The student will learn both the theory and practice of cold frames, transplanting, the making of soils, planting and cultivating; the raising of seeds for home and for market; the marketing of garden products. The manual training will accompany the lecture course.

   (b) **Landscape Gardening.** The artistic arrangement of lawns and landscapes, the plantation and care of shrubbery and flowering plants, the making of lawns and grass plats will be carefully studied from both the aesthetic and practical standpoint. Collateral readings will be required. The student will make designs and execute drawings illustrative of lawns and landscapes.

4. **Forestry.** The nursery already affords a large variety of trees from which the arboretum will be formed and the campus ornamented. This will afford the opportunity for the study of a large number of varieties, their habits of life, the best methods of cultivating forest trees, and making tree plantations. The attention for the present will be directed rather to the creation and preservation of young forests than to care of old forests, though some lectures will be given upon the latter, and collateral readings required.

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**Note.**—For short course in Horticulture, see under Agriculture.
VI.—DEPARTMENT OF ENGLISH LANGUAGE AND LITERATURE.

NANCY L. VAN DOREN, PROFESSOR.

The object of this course is two-fold—First, The practical use of the English language in writing and speaking; second, the study of the masterpieces of English and American literature, as the expressions of the best thoughts and highest ideals of the Anglo-Saxon race. The two lines of work are expected to supplement each other. The study of the art of expression and of life and character as expressed in the best literature is greatly aided by the study of the development of the race, and of the individual life and character of representative authors; and hence history and the history of literature is made an essential part of this course.

1. **Historical and Biographical Studies in English Literature.** Daily, first semester.

2. **Rhetoric and Essays.** The work in this course presupposes the completion of a preparatory course in Composition and Rhetoric. Diction, the qualities of style, figures of speech, the forms of composition are studied with care and largely in the light of the best specimens of English literature. The process is intended rather to be inductive than deductive. Constant practice is given in criticism. An effort is made to discover rhetorical principles from the study of standard authors. Two days in the week are devoted to the preparation and criticism of original essays. Daily, second semester. All students who are applicants for graduation are required to take this course.

3. **Masterpieces of English Literature.** Tennyson, Idyls of the King (Geraint and Enid), Emerson, Essay on Character; Milton, Paradise Lost—Books I and II, and L'Allegro; More, Utopia; George Elliot, Romola. Five days in the week throughout the year.

4. **Shakespeare.** Julius Cæsar, Hamlet, As You Like It. Four days in the week, first semester.
(b) The Drama. A study of the rise of the drama, with its influence upon the social and political development of the English race. Lectures accompanied by collateral readings. One day in the week, first semester.


6. Early English. Analytical study of Chaucer, Spenser, Vision of Piers, Plowman, etc. Five hours in the week, first semester.

7. Seminary Course. Competent students who have elected the English Language and Literature as their major course will be guided in special work in English. One day in the week, second semester. This course will not be given during the year 1895-6.

Facilities. The standard works of British and American poetry, fiction, essay, biography, etc., are to be found in the general library, as well as dictionaries and other more technical books.

VII.—DEPARTMENT OF ECONOMIC SCIENCE AND HISTORY.

ENOCH A. BRYAN, PROFESSOR.

The design of this department is to afford to the students an adequate means of studying the social and economic development of the race. The material basis of life being one of the chief concerns of mankind, economic history and the principles of economics will receive chief attention in all the courses. Social conditions and social development will be taken as the material for study, and no attempt will be made to find facts for the support of preconceived theories of politics or economics. The aim will be to train the student to be an investigator of social phenomena by the same general methods that he would pursue if he were an investigator of natural phenomena. The wisdom which comes through a knowledge of the
facts of human history, and a close observation of social and economic conditions, is a better guide, it is believed, for political action, than is any theoretic system of politics or economics.

1. Medieval and Modern European History. The study of a text will be supplemented by readings from standard historians, and reports on special topics. The student will be sent frequently to original sources, and instructed how to use these. An attempt will be made to teach the student how to gather and weigh historical evidence. The condition and development of the industrial classes in Europe during the middle ages will be briefly considered as the ground work of later study. Daily, first semester. Required of all applicants for graduation.

2. American Constitutional and Political History. This course presupposes the completion of some elementary course in "civil government" and familiarity with the text of the constitution of the United States. The constitutional and political history of the United States from the close of the revolutionary war to the end of Jackson's administration will be studied. Lectures will be supplemented by the study of Von Holst, Bancroft and Hildreth, and copious readings from Bryce's American Commonwealth. Students will be required to submit frequent written reports on assigned topics. Daily, second semester.

3. Political Economy. Double course. The terms Labor, Capital, Land, Wages, Interest, Rent, Profit, Money, Value, etc., as used in economic discussion, will be examined, and economic theory as set forth by earlier and later economists will be studied. Greater attention will be given to the subject of the distribution of wealth than to production or exchange. Practical social problems are kept constantly in view as being the aim for which the more systematic and technical study is undertaken. Daily, throughout the year.

4. English Constitutional and Institutional History. The foundation for this course will be laid in a brief review of the social and economic conditions and the institutions of the English race previous to the thirteenth century. In the study of the subsequent development such landmarks as the Magna Charta, the rise of the House of Commons, the Petition of Right, the Bill of Rights, the development of the Common Law will serve as a guide, together
with readings of standard authors on English Constitutional History.

5. **History of Financial Legislation in the United States.** Professor Dunbar's Course in Finance and Banking will be relied upon to furnish the texts of the successive laws. The financial reports of Hamilton, Gallatin and Dallas will be carefully examined, and the course of legislation from 1789 to the present time will be followed. The aim will be not to impose upon the student financial theories, but to lead him to examination of facts. Mondays, Wednesdays and Thursdays, second semester.

6. **The Social and Economic History of the Laboring Classes.** A study will be made of the successive systems of industry known as the family system, the guild system, the domestic system, and the present factory system, with a glance at the social condition of the people during each of these periods. This will be followed by a close examination of the condition of the laboring classes during the present century, and the legislation affecting them. First semester, Tuesdays, Thursdays and Fridays.

7. **Sociology.** This course will not be given during the year 1895–6.

**Facilities.** Besides a considerable number of books in the general library, a beginning has been made of a special library for this department.

VIII.—DEPARTMENT OF MECHANICAL ENGINEERING.

ADDISON R. SAUNDERS, PROFESSOR.

While the primary object of this work is to educate competent engineers, yet the importance of arranging work of such a character as to fit the student for the responsibilities of good citizenship has been fully recognized and time set apart for that purpose. Considerable latitude will be given the student in the matter of general electives so that he may select work in harmony with his tastes.
The aim of the department is to give more than manual skill. A broad grasp of the scientific subjects involved, as well as a technical knowledge, together with some dexterity in the manipulation of machinery, is sought for. The final aim of the several courses is to make engineers rather than mechanics.

Students in this department are expected to choose a special line of work as early as the first of the second semester of the junior year, as a technical preparation for entering one of the following professions, viz.:

E. **Electrical Engineering.**
H. **Hydraulic Engineering.**
M. **Mill Engineering.**
S. **Steam Engineering.**

The first two and one-half years in this department are devoted to careful preparation for the later special work; and it is expected that all students graduating from this department shall have a thorough knowledge of the underlying principles of mechanical engineering which are so essential in any of these professions.

**E. The Electrical Engineering Course** is designed to give a thorough, practical and theoretical knowledge of the construction, management and care of the more common forms of electrical machinery; also, familiarity with the different methods of electrical measurements and calculations, and ability to determine the quantitative relations of electrical units to the ordinary mechanical ones.

The special, theoretical and experimental electrical work of this department is intended to give the student the requisite experience that he may be able to deal understandingly with the varying problems in the generation and manipulation of electricity.

**H. The Hydraulic Engineering Course** is intended to give the student the technical education that will enable him to successfully solve such problems in the manipulation of liquids, as the development of water powers, economical municipal water supply, and river and harbor improvements.

**M. The Mill Engineering Course** should enable the student to design and superintend the construction of the various manufacturing plants, such as wood, iron, cotton and woolen factories.

**S. The Steam Engineering Course** is intended to train the student not only to be able to properly manage and care for any of the
various types of the steam engine, but to be competent to design and construct any required engine or its accessory apparatus. He should also be able to experimentally determine the efficiency of any steam power plant.

1. **Wood Work.** *Full course.* Thorough instruction in the use and care of tools; various joints discussed with reference to their proportions, strength and use. Students are taught to work from and read the drawings supplied. Principles of wood turning. Accuracy in all work is the particular feature exacted. Care and uses of all tools explained. Required of all Engineering and Agricultural students.

2. **Forge Work.** *Full course.* One semester, ten hours per week; including upsetting, drawing, bending, welding and shaping iron; manipulating and tempering of steel, and making the various tools required at the forge and in the machine shop. Lectures are given on the properties of iron, steel and coal used, and the case hardening of iron.

   Required of M. E. and Agricultural students; one-third required of all students in Civil Engineering department.

3. **Drawing.** *Full course.* Lead pencil sketching of geometrical figures; outlining and shading natural forms; principles of perspective; sketching simple machines; principles of elementary mechanical drawing for practice in the manipulation of drawing instruments; lettering.

4. **Drawing.** *Full course.* Notes on the selection, care and use of drawing instruments and materials; geometrical problems of construction; drawing room methods; tracing and blue printing; scale details.

   Three and four required of all Engineering students.

5. **Pattern Making and Foundry Practice.** *Full course.* One semester, ten hours per week. Notes on pattern maker's tools; construction of patterns and core boxes; shrinkage of castings; construction, care and management of cupolas; foundry equipment; preparation of sand, moulds and cores. Each student is assigned a period to act as foundry foreman, thus giving him experience in directing foundry work. Facility and accuracy in making patterns and castings are exacted.
6. **Machine Shop.** *Full course.* One semester, ten hours per week. Chipping, filing, turning, planing and milling iron. Lectures on the care and management of the various tools and machines. Accurate workmanship exacted.

Five and six required of all Mechanical students.

7. **Descriptive Geometry.** *Full course.* Theoretical study of the graphic method of representing geometrical magnitudes in space. Practical application in drawing room.

Required of all Engineering students.

8. **Mechanism.** *Full course.* Study of the elementary mechanical movements, various means of communicating motion; changes in velocity; feed motion; quick return movements; principles of outline and motion as applied to moving parts of machinery, such as gear teeth, cams, link work, pulleys and belting.

Required of all Mechanical students.

9. **Engineering Mechanics.** *Full course.* Consideration of the action of various forms and arrangements of different materials when subjected to the several varieties of force; of the properties, preparation and use of constructive materials. Lectures and laboratory work.

Required of all Engineering students.

10. **Designing.** *Full course.* Notes on machine design, followed by original design and working drawings of some subject appropriate to the line of work taken.

Required of all Mechanicals, and three-fifths required of Mining Engineers.

11. **Machine Shop.** *Full course.* Application of course 10 in the development of students' designs.

Required of all Mechanical students.

12. **Motors.** *Full course.* Consideration of such motors as windmills, steam, air and gas engines, compressors, refrigerators and hydraulic motors.

Required of all Mechanical students.

13. **Foundations and Masonry.** *Three-fifths course.* Including materials and methods employed in the construction of piers, abutments and retaining walls; economy of construction; strength of joined material; composition of different kinds of mortar.

Required of all Engineering students.
14. **Power Transmission.** *Three-fifths course.* A study of the different modes of transmitting power, such as shafting, rope, belt and toothed gearing, hydraulic, pneumatic and electrical transmission.

Required of all Mechanical students.

15. **Thermodynamics.** *Two-fifths course.* Mechanical theory of heat considered; methods of heating; combustion; thermal capacities; application of the subject to the steam engine.

Required of all students in courses E. and S.

16. **Hydromechanics.** *Two-fifths course.* Laws governing the action of liquids at rest or in motion; effect of friction on the flow of water in pipes; delivery through orifices, pipes and canals.

Required of all students in H., M. and Civil Engineering courses.

17. **Electrodynamics.** *Full course.* Consideration of the construction and use of galvanometers, batteries and dynamo electrical machines.

Required of E. students.

18. **Water Power Development.** Canal and dam construction; study of developed water powers of note; exhaustive problems taken up and solved.

Required of H. and M. students.

19. **Mill Architecture.** *Full course.* Different kinds of manufacturing plants considered; manufacturing economy; building materials and construction; arrangement of different plants; original problems solved.

Required of all M. students.

20. **Steam Engine Details and Boiler Practice.** *Full course.* Valve gears and reciprocating parts; calculations, design and working drawings of some type of steam engine; various forms of boilers considered; points of excellence in each designated; calculations of sizes and forms of different parts, such as tubes, thickness of plates, rivets, braces and stays, grates and heating surface, steam and water gauges, injectors, pumps and settings.

Required of all S. students.


Required of all Mechanical students.

**Note.**—Excursions will be made to various plants at accessible points, and the practical workings of the plants will be studied under the direction of a competent engineer.
MECHANICAL ENGINEERING EQUIPMENT.

**Power House.**—A new brick building containing isolated heating, lighting and power plant. The equipment in this building is available for testing work in the various lines.

**Forge Shop and Foundry**—Are located in the old power house; both well equipped with the necessary tools.

**Mechanical Hall.**—A new brick building of one and two stories, containing the various mechanical laboratories and other rooms, viz.: Director's office, lecture, reading, blue print, drawing, locker, toilet and tool rooms, wood and machine shops and testing laboratory. Power for running all shops is obtained from electric motors.

**Drawing Room.**—A well lighted and liberal sized room on the second floor; fitted with sixteen adjustable drawing trestles and tables, straight edges, designer's blackboard, beam compasses, large triangles and cabinets for drawings.

**Blue Print Room.**—Light in this room is softened by using tinted glass windows, so that sensitive papers are not marred. Room is well supplied with exposure frame, bath and storage cabinet.

**Reading Room.**—For the use of students in this department, it is supplied with the following periodicals, viz.: Sibley Journal of Engineering, Electricity, Street Railway Gazette, Architect's Electrical Bulletin, Electrical Age, Electrical World, Manufacturer and Builder, Metal Worker, Inventive Age, Industry, Age of Steel, Locomotive, Western Electrician, Engineer, Electrical Industries, Milling World, Manufacturer's Record, American Artisan, Street Railway Review, Carpentry and Building, Lumber World, Iron Industry Gazette, Iron Age, Street Railway Journal, American Wood Worker, Foundry.

**Mechanical Library**—Contains about 150 volumes by some of the best known authors of engineering works.

**Locker and Toilet Rooms.**—These rooms contain lockers for the private uses of students working in the shops, and all necessary toilet facilities.

**Tool Room.**—In this room are kept all special tools and supplies not contained in sets. Windows open into each of the shops, through which tools and supplies are loaned to the students. Check system is used.
Wood Shop.—Is fitted with twenty-four sets of hand tools and benches, and the following wood working machinery, viz.: Five wood lathes, one pattern maker's lathe, one universal wood worker, rip and cross cut saws, scroll saw, band saw and grind stone. Accommodations for thirty students.

Machine Shop.—Contains five metal turning lathes, one turret lathe, one universal milling machine, one metal planer, one pipe cutting and threading machine, one friction drill, two sets of pipe taps and dies and the necessary vises, benches, hand tools, reamers, drills and other tools essential to a well equipped machine shop. Accommodations for twenty-five students.

Forge Room.—Contains sixteen blast forges, one No. 0 Buffalo portable forge and the necessary blacksmith's tools. Accommodations for twenty students.

Experimental Laboratory.—Is equipped with four boilers, thirty horsepower engine, three steam pumps, one injector, one water meter, one accurate testing steam gauge, six steam gauges, four water gauges and different types of valves, one constant potential 15 kw. dynamo, one 11 kw. motor (electric), one ½ kw. dynamo and motor, volt and amperemeters, rheostats, batteries, switches and testing apparatus.

PHYSICS.

The new physical laboratory will be ready for use at the beginning of the year '95-'96. The department is well supplied with apparatus both for purposes of illustration and measurements of precision.

1. Advanced Physics. One full course.

(a) Lectures and Laboratory, one semester. Lectures on mathematical and molecular physics, theory of gases, kinetics, acoustics, correlation and conservation of energy, heat, light, magnetism and electricity. Transcription of notes required. This work is designed to familiarize the student with the methods of exact experimentation and measurement. The work consists of precise weighings, measurements, determination of destiny and specific gravity, barometric readings, magnetic declination and inclination, variation of magnetic intensity, magnetic moments, resistance of conductors and batteries, electromotive force, potential, strength of currents,
verification of the laws of sound and radiant heat, specific and latent heat, focal and wave lengths. Required of all students except Botany and Zoology and Economic Sciences and History. Presupposes the completion of the work specified in the preparatory department.

IX.—DEPARTMENT OF MILITARY SCIENCE AND TACTICS.

LIEUT. GEORGE E. STOCKLE, TENTH CAV., U. S. A., PROFESSOR.

All the able bodied male students of the college are enrolled. The organization will be that of a battalion of infantry and a section of artillery. Instruction will be practical and theoretical.

1. Practical Instruction. As soon as the company organizations are completed drills will be had in the United States infantry drill regulations, beginning with the school of the soldier and advancing through that of the squad and the company to the battalion. At first the drills will be in close order and afterwards in extended order. Especial attention will be given to the latter, and to battle exercises and problems in minor tactics.

The artillery detachment will be made up of men selected for general efficiency and thoroughly drilled in the school of the section. A part of the course will be devoted to military signaling with flags and torches.

Small arms target practice will be an important feature. At a convenient time during the year the cadets will be encamped for several days, giving an opportunity for the practical study of marching, guard, outpost duty and kindred duties.

2. Theoretical. Officers' school is held during the winter months. All commissioned and non-commissioned officers are required to attend. The instruction will be in drill regulations, guard manual, administration and reports and returns. A course of lectures will be delivered on the following subjects:

Muster in, embarkation and travel.
Camps, camp cooking, correspondence and returns, duties of staff officers.
Guard duty, outposts, reconnaissance and scouting.
Marches, advance, rear and train guards, bivouacs.
Field engineering.
Preservation of health, care of wounded.
Military law and courts martial.
Civil relations of military; street riots.
All cadets are required to be uniformed. The uniform is durable and neat, and costs about $14.

Facilities. An armory furnishes the opportunity for indoor drill. Arms, ammunition and equipments are issued to the college by the United States government for the use of cadets.

FOREIGN LANGUAGES.

Advanced technical courses are next to impossible without a command of one or more languages other than the English. The disciplinary effects of linguistic study are universally acknowledged, but while this has been kept in view, it is rather as an instrument for special work that these languages are offered in this institution. The minimum requirement for graduation in any department is two years of study of some language other than the English. Courses are offered in German, French and Latin. The collegiate Latin offered presupposes the completion of a two years' work in preparatory Latin.

GERMAN.

ANNIE HOWARD, INSTRUCTOR.

The primary object of this department is to give the student as soon as possible use of the language for the various purposes which his special needs may require, and more especially to facilitate the use of German literature on scientific subjects.

This practical result is soonest obtained by work with the language itself; hence free translations and copious progressive read-
ings are introduced almost at the beginning of the course. Systematic study of German grammar is pursued and combined with progressive written and oral translations from English into German. Aside from the cultivation of the critical faculty, this practice is intended to give ready and accurate expression, thus laying a foundation for future colloquial use of the language.

Much attention is incidentally given to the more common rhetorical figures, the arrangement of sentences and to the signification of suffixes in the formation of secondary words.

1. **Elementary German.** First Lessons in German (Collar's Eysenbach); German Prose (Boisen); memorizing short selections. In the second semester the Joynes-Meissner Grammar will be used and the German prose completed. Höher als die Kirche (Hillern); Anfang und Ende (Heyse); easy comedies by Benedix and Wilhelm. Throughout the year, five days in the week. Required of all whose major is Chemistry or Biology.

2. **Joynes-Meissner Grammar, continued.** Harris's Prose Composition; Soll und Haben (Freytag); Brigitta (Auerbach); Scientific German (Hodges). During the second semester the prose composition will be completed. Der Fluch der Schönheit, or Burg Neideck (Riehl); Die Journalisten (Freytag); scientific monographs and current periodicals. In this course much time will be given to scientific reading, and during the last six weeks of the course grammar and dictionary will be laid aside and rapid and uncritical reading will be required in order to establish independence and habits of observation and induction. Five days in the week throughout the year.

3. **Advanced German.** Earlier writers of the seventeenth century, as Undine (Fouqué); Aus dem Leben eines Taugenichts (Eichendorff) Peter Schlemihl (Chamisso). Prose and Poetry of Heine. A study of German literature will be begun in this course in a more critical manner, though the aim in every course will be to emphasize correct ideas of the nature of the language and to secure some of the important disciplinary results of elementary linguistic study. Lectures upon the history of German literature will be given from time to time, and advanced students will be required to supplement their work by essays and discussion. Two days in the week.
4. German Club. For the benefit of technical students, whose time may limit them to course 2, a club will be formed with which the instructor will read and confer once a week.

FRENCH.

The course in French aims not only to give the student fluency in reading modern writers and scientific treatises, but also to encourage, as much as the shortness of the course will permit, use of the language in conversation.

The easy and progressive readings of course 1 will be supplemented by oral and written translations of English into French, and systematic instruction in syntax and etymology will be given until the student is well grounded in grammatical construction.

The readings will be varied and copious, and in course 2 much time will be given to scientific French, for the benefit of those taking a technical course.

The third course will be more of a study of the literature and the history of the language, its development, its relation to the Latin, its derivations and idioms.

Advanced composition will be carried through the first semester, and the readings during the second semester will be diversified by lectures.

1. Elementary French. Introduction to French language (Van Daell); French reader; La Mère Michel et son Chat (Bedoillière); La Cigale chez les Fourmis (Labiche), and other easy plays; France's Abielle; easy plays. Five days in the week throughout the year.

2. Advanced Course. La Petite Fadette (Sand); La Belle Niervaine (Daudet); Pierre et Camille (De Musset); scientific French reading; La Mare au Diable (Sand); Le Medicin Malgré Lui (Molière); French plays and scientific reading; selections from Les Miserables (Hugo).

3. History of French Literature, accompanied by classical prose reading from Hugo, Lamartine, Fenelon and others; reading of classical plays, Corneille, Racine and Moliere. Much conversation. This is an optional course.

Course 3 will not be offered this year.
LATIN.

Two years work in Latin beyond the usual preparatory Latin are offered to those desiring to elect a more purely literary course or wishing to use this language as an instrument for study along special lines.

1. Cicero's Orations and a course in Roman Antiquities will constitute the work of the first semester. The orations against Catiline, the Poet Archias and the Pro Lege Manilia. The work in Roman Antiquities will include a study of the social and economic conditions of the Romans.

2. The Odes of Horace and the De Arte Poetica, together with a study of Roman Literature, are offered during the second semester. Lectures will be given one day in the week in the latter, and collateral readings will be required. Scanning and rhythm will be studied in connection with the readings of Horace.

3. The Latin Historians, particularly Livy and Tacitus, will form the basis of the second year's work in Latin, though the authors read will vary from year to year.

VETERINARY SCIENCE.

S. B. NELSON, PROFESSOR.

With the beginning of the next year a course in Veterinary Science will be offered. A description of the course will be issued later.
ADMISSION.

Candidates for admission must present evidences of good moral character. Students coming from another college must present a certificate of honorable dismissal.

REQUIREMENTS FOR ADMISSION TO FRESHMAN CLASS.

Candidates for admission to the Freshman class must be at least fifteen years of age, and must pass satisfactory examination in the following branches:

**English (a).**—A brief essay on a subject selected from one of the following texts:


For 1897—Hawthorne's House of the Seven Gables, Whittier's Snow Bound, Shakespeare's Merchant of Venice, Macaulay's Essay on Byron.

The candidate is expected to have read all the books indicated for the year in which his examination occurs.

**English (b).**—English grammar, including the analysis and synthesis of English sentences.

**English Composition.**—The following works will indicate the amount of knowledge required: Reed & Kellogg's Higher Lessons in English; Lockwood's Lessons in English.

**Mathematics.**—Arithmetic, including the metric system, elementary Algebra, through quadratics, and plane geometry. Ordinarily one year will be required to complete the preparatory work in elements of Algebra.

**United States History.**—Eggleston or Barnes will indicate the extent and character of the work required for admission.
Geography.

Physiology.—Martin’s Brief Course is suggested as presenting about the amount and kind of work required.

Elementary Physics.—The completion of the work laid out in such a work as Gage’s Elements is expected.

Elementary Botany.—Gray’s Lessons is used as the text in the preparatory department, and a similar brief course is required.

There will be no requirement in any foreign language, but the usual preparatory course in Latin will be extremely desirable.

ADMISSION TO ADVANCED STANDING.

Applicants for admission to advanced standing must, in addition to the requirements for the Freshman class, present examinations or other satisfactory evidence of the completion of the work already done by the class which they wish to enter.

ADMISSION WITHOUT EXAMINATION.

Graduates of high schools whose course of study has been examined and approved by the Faculty will be admitted without examination, on the presentation of the certificate of the principal or superintendent of the high school, showing the work done by the applicant. Teachers holding a first grade certificate will be admitted to the Freshman class without examination.

ADMISSION TO PREPARATORY DEPARTMENT.

Candidates for admission to the Preparatory Department must be at least thirteen years of age, must present evidence of good moral character, and must pass a satisfactory examination in the common English branches. Holders of third grade teachers’ certificates will be admitted to the Junior
Preparatory class without examination. Holders of second grade teachers' certificates will be admitted to the Senior Preparatory class without examination.

County superintendents having a graded system in the district schools may submit their courses of study for approval to the Faculty. If approved, the certificate of the county superintendent, showing that the course of study has been completed in a satisfactory manner by any candidate, will be accepted in lieu of examination for admission to the Junior Preparatory class.

ENTRANCE EXAMINATIONS.

Examinations for admission are held at the College one day prior to the opening of the fall session; in 1895, on September 25th, at 9 o'clock. All persons who desire to enter the College should be present the first day. Special examinations may be arranged later by application to the President of the College.

APPLICATION.

In making application for information with a view to entering College, applicants should state their age, the studies already pursued and their attainments. Catalogues will be sent free to any address on application.
EXPENSES.

*Tuition is free in all departments.*

The use of both the College and Experiment Station libraries is free to all members of the College.

BOARDING.

The College does not provide table board. It has furnished a dining room and kitchen. The boarding department is managed by a committee of the Faculty, who employ a steward and manage all the affairs of the club. Each student must, upon entering the club, deposit with the treasurer of the committee $10. At the end of every month of four weeks an assessment is made, each member paying but the actual cost per capita for the month. Each boarder must pay his assessment within three days after it is due or forfeit his seat at the table.

The cost of boarding is usually the largest item in a student's expenditures. A systematic effort has been made to reduce the expense to the lowest amount consistent with good living, and it is believed that this effort has been successful. The cost of meals for the past year has averaged only $2.12 a week, and they have been of excellent quality and well served. It is believed that the cost of board will not hereafter average over $9 per month.

ROOMS IN THE DORMITORY.

The rental of rooms in the third and fourth floors of the boys' dormitory is $17 a year for each student; on the first and second floors, $20 a year for each student. By bad conduct a student will forfeit room and rental paid.
Half the yearly rental is due at the beginning of the first semester and the same at the beginning of the second semester. A student entering on or after the middle of a semester will be charged $5 to $6 for the remainder of that semester. Each room is provided with a single or double bedstead with woven wire mattress, two chairs, one table and one washstand. Students rooming in the dormitory must provide themselves with the following: Four or more sheets (for single bed); three or more pillow cases; one pillow and mattress (the latter can best be purchased here); bedclothes (blankets and comfortables); four or more towels; one wash basin, pitcher and slop pail (can be purchased here); four table napkins; one looking glass. Students are advised, but not required, to carpet their rooms. They would also do well to provide an easy chair and a cover for study tables. Study tables are all 2'3"x3'6". Students are responsible for the return, in good condition, of all furniture in their room, and, also, for the room itself.

It is expected that the girls' dormitory will be ready for occupancy the coming fall term. The price of rooms will vary, but the average will be about the same as in the boys' dormitory.

All students must present to the proctor a receipt from the bookkeeper showing that the room rent is paid before a room will be assigned.

**DAMAGE DEPOSIT.**

Each student living in the dormitory shall always keep on deposit at the business office one dollar as a damage deposit. Damage to any room or its furniture will be charged to the occupants of the room. Damage to any other part of the building will be charged *pro rata*. 

LIVING IN THE TOWN OF PULLMAN.

Good boarding may be obtained in the town of Pullman at reasonable prices. Students who desire to rent a room and board themselves may do so in the town at a very low expense, but the location must be satisfactory to the faculty. This plan is not recommended.

BOOKS.

Books are supplied at the business office at cost. All books purchased at the office must be paid for when received. A few second-hand books are let to needy students at a small rental.

SUMMARY OF EXPENSES.

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room rent in the dormitory (including heat and light, average)</td>
<td>$18.50</td>
</tr>
<tr>
<td>Boarding 37 weeks (boarding has averaged $2.12 a week for the past year), about</td>
<td>$78.50</td>
</tr>
<tr>
<td>Books about</td>
<td>$10.00</td>
</tr>
<tr>
<td>Laundry about</td>
<td>$15.00</td>
</tr>
</tbody>
</table>

Total necessary expense for year $122.00

COST OF MILITARY SUIT.

The cost of the military suit of cadet gray made to order is about $14.

The students buy this suit direct from the manufacturers, and make a saving of from five to ten dollars a suit. It is of excellent quality and well made. The plan has the advantage of supplying neat and serviceable clothing at a small cost and placing all on an equality in the manner of dress.

LABORATORY FEES.

Students in the chemical laboratory have the use of apparatus free. A small fee is charged to cover the cost of chemicals used. The student also pays for the apparatus broken.
GENERAL INFORMATION.

EXPLANATION OF THE COURSES OF STUDY AND METHODS OF INSTRUCTION.

By the terms of the act creating the institution, it is required to give instruction, so far as possible, by laboratory methods, and this will be adhered to, as far as practicable, in all courses of instruction. The general plan of the courses is what is known, usually, as the plan of majors and minors. The student will be required to elect one of the courses of study offered, as his major subject, and pursue that throughout the entire four years of his College course. The underlying idea is, that it is better to know one thing thoroughly than to have a smattering of a great many things. It is expected that at the end of his course he will be master of the subject that he has chosen as his major. In the more technical courses, for example those in engineering, almost all the studies throughout the course are necessarily specified. In the other courses, as large an opportunity as possible is given for election, particularly in the junior and senior years. Elections must be made in all cases in such a way that there will not be a conflict in the recitation period. The College will not organize special classes to provide for the accommodation of students who elect courses where there is such a conflict in the period of recitation. All election of studies is subject to the ratification of the faculty. Students will be expected to choose their course on entering the Freshman class. It will be observed that all courses in the Freshman class are quite similar. If a student at the close of the Freshman year should discover that a serious mistake has been
made in the course elected, he may petition the faculty to be allowed to change his course, and the faculty, after consideration, may permit him to do so. An election between the various Mechanical Engineering courses need not be made until the junior year.

ATHLETICS.

An athletic association composed of students and members of the faculty has been formed. An athletic ground has been made, and croquet grounds and tennis courts, etc., for outdoor exercise, are in process of construction. The gymnasium affords an excellent place for exercise in inclement weather. It is the policy of the College to encourage an abundance of exercise, and a committee of the faculty has been appointed to look after this part of the student’s training.

MILITARY TRAINING.

By both the state and national laws affecting this institution, it is required to give a military training to all male students. The College will comply with the law, and will require all male students who are not physically unfit for it to take the military drill for a given number of years. All male students will be required to provide themselves with a uniform of cadet gray. The uniform costs not over $15, which is several dollars cheaper than such a suit could be bought for from the stores. It may be worn as a school suit, and as such is very satisfactory. It not only saves the student money, but places all students on an equality in the matter of dress, which is very desirable.

MUSIC.

 Provision will be made for the coming year for complete instruction in vocal and instrumental music for those who may desire it. Those wishing individual instruction in music
will be expected to pay a moderate rate for the same. Parents who are anxious to have their children continue their music in connection with their literary studies can rest assured that both in quality and cost they will find as satisfactory arrangements here as elsewhere.

DOMESTIC ECONOMY.

A course of lectures in domestic economy is given to the young women during the latter part of the first and the beginning of the second semester. The dining room and kitchen of the dormitory serve as a "laboratory" for illustrating the work of this department. Young women desiring to take the course in dairying will be permitted to do so; also they make a choice of course in floriculture.

SHORT COURSES IN AGRICULTURE AND HORTICULTURE.

A short course of lectures to actual farmers and fruit growers will be given during January and February, 1896. It will consist of lectures and illustrative experiments by the Professors of Agriculture, Horticulture, Chemistry, Botany and Entomology. Soils, fertilizers, breeds and breeding of stock, care and feeding of stock, dairying, fruit growing, insect and fungous pests and methods of prevention and destruction will be among the subjects treated. Farmers will be able to obtain boarding at reasonable rates and will find this course of lectures by specialists in those departments most interesting and instructive and profitable. Occurring as it does during a season of the year when the farmers and fruit growers can best get away from the farm, it is hoped that a large number of farmers will avail themselves of the opportunity. Special circulars will be issued later in regard to this course. The course given in 1895 was well attended. The enrollment reached 304, representing ten counties, and the interest manifested was very great.
OTHER SHORT COURSES.

Short courses of instruction in practical agriculture and horticulture are given elsewhere in the catalogue. The design of this course is to meet the wants of those who come from the farm and go back to the farm after a short course. The course will be two years of six months each. A student will not be allowed to take more than two literary branches, and will be required to spend at least one half of his time in the practical work of the agricultural or horticultural departments. He will be under the same regulations precisely as all other students of the institution. Ordinarily the literary work of such a student will be in the preparatory department.

TERMS AND HOLIDAYS.

The College year is divided into two halves called semesters, the first semester closing February 15th, and the second semester beginning February 16th; no vacation intervening. The usual Christmas and Easter holidays will occur as specified in the calendar. The other holidays are Thanksgiving, Washington's birthday and Memorial day.

REQUIREMENTS FOR GRADUATION.

All applicants for graduation of whatever course shall, in addition to the completion of the major subjects as prescribed, have completed Economic Science and History 1, English Language and Literature 2, and one other semester of English Language and Literature; also, Mathematics 1 and 2; also, two years of some language other than the English. All applicants for graduation must present 30 full courses out of the 32 scheduled. In each case the faculty will decide which two of the 32 courses may be omitted. Each course consists of 5 hours a week, or an equivalent, for one semester.
LITERARY SOCIETIES.

Three literary societies have been maintained during the past year. The Chewawa Society was organized by the preparatory department, and was under the care and direction of the principal of the junior preparatory class. It met on Friday evening of each week.

The Columbian Literary Society was organized and maintained by the Collegiate and Preparatory students, and met on Friday evening of each week.

The Washington Society, organized during the year, begins with bright prospects. It also meets on Friday evening.

OTHER SOCIETIES.

A Young Men’s Christian Association and a Young Women’s Christian Association were organized and conducted by students during the year.

The members of the Mechanical Engineering department formed an organization for special study and report, as have also the members of the Civil Engineering department. Reports and papers are prepared on special subjects and submitted to the clubs for discussion and criticism.

CARE OF DORMITORY ROOMS.

Students will be required to take care of their own rooms; they must sweep, dust, make their beds and clean their windows periodically, and their rooms will be frequently inspected to see that this is done.

The girls’ dormitory is in care of a preceptress, who is a member of the faculty. The health as well as the social, intellectual and moral habits of the young ladies is looked after carefully.

The boys’ dormitory is in charge of a proctor whose duties are similar to those of the preceptress. Students are required
to observe dormitory regulations, or otherwise they will forfeit the privileges of the dormitory and be subject to other discipline.

DISCIPLINE.

The entire conduct of students enrolled in the College, whether they make their home in the dormitory or elsewhere, shall be under the supervision of the President of the College and the College faculty. The institution is in no sense a reform school, and will not undertake the care and direction of incorrigible students; such students will be sent to their parents to be placed where they may belong. The discipline is kind and firm, and it is expected that all students shall have arrived at such an age of discretion that they will be able to conduct themselves as ladies and gentlemen. If they have not, the College is not the place for them. The deportment and manners of students, particularly those who are in the dormitory, will be carefully looked after.

PECUNIARY AID TO STUDENTS.

This institution does not follow the policy of creating employment for students. A student's time is more valuable when spent in study than any compensation he could receive for labor. If a student is acquiring an education he cannot afford to take much time from his study room, the recitation room and the laboratory for the earning of a livelihood; besides, it would be uneconomical and unsatisfactory to have the station work done in that way. The care of teams must be entrusted to regular and competent employes who will be responsible for their proper management. Nevertheless, there is in the various departments a certain amount of work which may be done by student employes, and where such is the case the policy of giving such work to students is adhered
to, and the student is paid for the same at the rate of 12½ cents an hour.

In the Mechanical Engineering department a double opportunity arises of gaining a larger experience in the manipulation of machinery and the doing of work which is necessary to the running of that department. Such work is given to the students of that department. The same thing is true, to a limited extent, in the Agricultural and Horticultural departments; also, in the janitor and dormitory work. But the amount of such is limited, and no student should come expecting to pay all his expenses from the money he might earn. Deserving and needy students will be given the preference in assigning such work. It should be borne in mind that the "laboratory work" of the Agricultural and Horticultural departments will be required of all the students of these departments, and that students must expect no pay for such work. It is a part of the student's training.
THE PREPARATORY DEPARTMENT.

GEO. H. WATT, PRINCIPAL.

The department is maintained to furnish instruction for those who are not sufficiently advanced to enter the Freshman class. There are many young men and women in the state, particularly the children of farmers, who have not the advantage of a city high school, and it is in view of this fact that such a course is deemed advisable.

The course of instruction offered covers a period of two years, and aims to give a sound training and such development as will enable the student to carry any of the College courses successfully.

ADMISSION.

Applicants for admission must be at least thirteen years of age,* and be able to pass a satisfactory examination in reading, in arithmetic, in English grammar and language far enough to show familiarity with the different parts of speech, and ability to analyze sentences with ease and accuracy.

He must also show, in general, such thoroughness in these branches and such development as will indicate ability to pursue the preparatory studies of the first year creditably before he will be received.

For admission to higher standing it will be necessary, in addition to this, to pass an examination in the studies taken by the class entered. A second grade teachers' certificate will

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*The average age of members of this department is much higher.
be accepted in lieu of examination to enter the Senior Preparatory year.

Tuition is free in this department, as in all others. The only College charges are those already indicated for College students.

JUNIOR YEAR.

The Junior year will be devoted very largely to work in the common branches, and will be found very desirable for those who are reviewing with a view to examination for teachers' license, as well as preparing for entrance to college. In addition to the work in arithmetic, United States history, grammar and physiology, a half year will be devoted to the study of the United States constitution, a half year to elocution and penmanship and a half year to algebra.

In the Senior year algebra will be completed and work in English will be continued, and physics, geometry, botany and general history will fill out the complement of studies. Those completing satisfactorily the required course of the Senior year will be granted diplomas and passed to graduation. This diploma will be received in lieu of examination for entrance to the Freshman class.

Latin is offered in both Junior and Senior years to those who desire to elect it.

COMMERCIAL COURSE.

A Commercial course consisting of a thorough training in bookkeeping, commercial arithmetic, penmanship, English grammar and composition, is provided for to meet the wants of those who contemplate engaging at once in some business. Those who preferred have hitherto taken a course in stenography and typewriting. Those who desired to do so have combined the study of these with the business course. The
College is supplied with five Remington typewriters and five Smith Premiers. A special instructor in stenography, typewriting and bookkeeping will be chosen during the coming summer, and excellent facilities in these lines will be offered during the coming year. A special course in keeping of farm accounts is provided for students of the Agricultural department.
SCHEDULE OF STUDIES.

PREPARATORY DEPARTMENT.

Junior Year.

First Semester.—Arithmetic—Hobb's Academic, complete. United States History—Scudder, complete. Grammar—Reed & Kellogg’s Higher Lessons, or Latin. Elocution (three days in week). Penmanship (two days in week).

Second Semester.—Algebra—Wentworth’s Elements to chapter xi. Physiology—Martin’s Briefer Course, complete. English Classics and Composition, or Latin. (The Classics to be read will vary from year to year.) United States Constitution (Andrews), and Constitution of Washington.

Senior Year.

First Semester.—Algebra—Wentworth’s; quadratics completed. Physics. Composition and Literature—Lockwood’s Lessons in English and Study of English Classics. Shop work, carpenter shop (ten hours, or Physical Geography, or Latin). Shop work required of all students expecting to take the work of Departments I, IV and VIII.

Second Semester.—Geometry—Wentworth’s, four books. Physics (four weeks). Botany (fourteen and a half weeks). General History—To the fall of the Western Empire. Drawing, ten hours, or Latin. Drawing required of all students expecting to take the work of Departments I, II, III, IV and VIII.
SCHEDULE OF COURSES OF INSTRUCTION.

COURSE IN CIVIL ENGINEERING.

Freshman Class.

**First Semester.**—Solid Geometry; Mediæval and Modern European History; French or German; Mechanical Drawing (10 hours).

**Second Semester.**—Trigonometry; Rhetoric; French or German; Forging (6 weeks); Field Work (12 weeks).

Sophomore Class.

**First Semester.**—Higher Algebra; French or German; Physics; Descriptive Geometry (10 hours).

**Second Semester.**—Analytical Geometry and Calculus; French or German; Surveying; English Literature.

Junior Class.

**First Semester.**—Calculus; Engineering Mechanics; Road and Railroad and Topographical Surveying; Analytic Mechanics.

**Second Semester.**—Road and Railroad and Topographical Surveying, \( \frac{3}{8} \); Hydrostatics (Hydromechanics), \( \frac{3}{8} \); Elective; Elective; Elective.

Senior Class.

**First Semester.**—Roofs and Bridges; Sanitary Engineering (Sewerage and Water Supply); Astronomy; Elective.

**Second Semester.**—Irrigation Engineering; Contracts and Specifications, \( \frac{3}{8} \); Foundations and Masonry, \( \frac{3}{8} \); Elective; Thesis.
COURSE IN MINING ENGINEERING.

Freshman Class.

First Semester.—Solid Geometry; Mediaeval and Modern European History; French or German; Mechanical Drawing (10 hours).

Second Semester.—Trigonometry; Rhetoric; French or German; Forging (six weeks); Field Work (12 weeks).

Sophomore Class.

First Semester.—Higher Algebra; Descriptive Geometry; French or German; Chemistry.

Second Semester.—Analytical Geometry and Calculus; French or German; Chemistry; Machine Shops.

Junior Class.

First Semester.—Calculus; Physics; Analytical Mechanics; Engineering Mechanics.

Second Semester.—Hydromechanics, ½; Thermodynamics, ½; Topographical Surveying; Reduction Machinery, ½; Machine Design, ½; Elective.

Senior Class.

First Semester.—Roofs and Bridges; Geology; Steam Engine Details and Boiler Practice; Chemistry and Mineralogy.

Second Semester.—Contracts and Specifications (two hours); Foundations and Masonry (three hours); Assaying and Metallurgy and Chemistry; Elective; Thesis.
COURSE IN CHEMISTRY.

Freshman Class.

First Semester.—Solid Geometry; Mediæval and Modern European History; German; Chemistry.

Second Semester.—Trigonometry; Rhetoric; German; Chemistry.

Sophomore Class.

First Semester.—Chemistry; German; French; Physics.

Second Semester.—Chemistry; German; French; English Literature.

Junior Class.

First Semester.—Chemistry; Elective; Elective; Elective.

Second Semester.—Chemistry; Elective; Elective; Elective; Elective.

Senior Class.

First Semester.—Chemistry; Elective; Elective; Elective.

Second Semester.—Chemistry; Elective; Elective; Elective; Elective.
COURSE IN BOTANY AND ZOOLOGY.

Freshman Class.

First Semester.—Solid Geometry; Mediæval and Modern European History; German; Botany or Zoölogy.

Second Semester.—Trigonometry; Rhetoric; German; Botany or Zoölogy.

Sophomore Class.

First Semester.—Botany or Zoölogy; German; Elective; Chemistry.

Second Semester.—Botany or Zoölogy; German; Chemistry; English.

Junior Class.

First Semester.—Botany or Entomology; French; Elective; Elective.

Second Semester.—Botany or Zoölogy; French; Elective; Elective.

Senior Class.

First Semester.—Botany or Zoölogy; Elective; Elective; Elective.

Second Semester.—Botany or Zoölogy; Elective; Elective; Elective.

Note.—One year of Latin required of all students of this department. It is preferred that this should be taken in the preparatory course.

Note.—All Botanical students must take Botany the first two years; all Zoölogical students must take Zoölogy the first two years.
COURSE IN AGRICULTURE.

Freshman Class.

First Semester.—Medieval and Modern European History; Solid Geometry; Chemistry; Agriculture (Comparative Anatomy and Physiology).

Second Semester.—Trigonometry and Land Surveying; Rhetoric; Chemistry; Veterinary Science.

Sophomore Class.

First Semester.—Agriculture (farm crops and principles of feeding); Botany; French or German; Chemistry.

Second Semester.—Agriculture (Breeds and Breeding); Botany; French or German; Chemistry.

Junior Class.

First Semester.—Agricultural Physics; German or French; Entomology; Agricultural Chemistry.

Second Semester.—Agriculture (dairying); French or German; History of Financial Legislation in United States; Agricultural Chemistry.

Senior Class.

First Semester.—Farm Economy and Special Work in Agriculture; History of the Laboring Classes; Elective; Elective.

Second Semester.—Agriculture (special work); Elective; Elective; Elective.

SHORT COURSE IN AGRICULTURE.

First Year.—Agriculture; Horticulture; Mathematics; English.

Second Year.—Agriculture; Botany; Chemistry; Entomology (six weeks); Veterinary Science (six weeks); Horticulture (twelve weeks).
COURSE IN HORTICULTURE.

**Freshman Class.**

**First Semester.**—Solid Geometry; Mediaeval and Modern European History; Botany; Horticulture.

**Second Semester.**—Trigonometry; Rhetoric; Botany; Horticulture.

**Sophomore Class.**

**First Semester.**—Horticulture; French or German; Chemistry; Physics.

**Second Semester.**—Horticulture; French or German; Chemistry; English Literature.

**Junior Class.**

**First Semester.**—Entomology; French or German; Elective; Elective.

**Second Semester.**—Landscape Gardening; French or German; Elective; Elective.

**Senior Class.**

**First Semester.**—Botany; Elective; Elective; Elective.

**Second Semester.**—Botany; Elective; Elective; Elective.

**Note.**—The short course in Agriculture includes the short course in Horticulture.
COURSE IN ENGLISH LANGUAGE AND LITERATURE.

Freshman Class.

FIRST SEMESTER.—Historical and Biographical Studies in English Literature; Solid Geometry; Mediæval and Modern European History; French, German or Latin.

SECOND SEMESTER.—Trigonometry; Rhetoric; French, German or Latin; Constitutional and Political History of America.

Sophomore Class.

FIRST SEMESTER.—English Literature (study of masterpieces); French, German or Latin; Elective; Elective.

SECOND SEMESTER.—English Literature (study of masterpieces); French, German or Latin; Elective; Elective.

Junior Class.

FIRST SEMESTER.—Shakespeare and History of the Drama; French, German or Latin; Constitutional History of England; Elective.

SECOND SEMESTER.—Oratory; French, German or Latin; Elective; Elective.

Senior Class.

FIRST SEMESTER.—Early English; Elective; Elective; Elective.

SECOND SEMESTER.—Special Work in English; Elective; Elective; Elective.
COURSE IN ECONOMIC SCIENCE AND HISTORY.

Freshman Class.

FIRST SEMESTER.— Solid Geometry; Mediæval and Modern European History; French, German or Latin; Elective (with the consent of the head of the department).

SECOND SEMESTER.— Trigonometry; Constitutional and Political History of America, 1789–1887; French, German or Latin; Rhetoric.

Sophomore Class.

FIRST SEMESTER.— Political Economy; German, French or Latin; English Literature; Elective.

SECOND SEMESTER.— Political Economy; German, French or Latin; English Literature; Elective.

Junior Class.

FIRST SEMESTER.— Constitutional History of England; French, German or Latin; Elective; Elective.

SECOND SEMESTER.— History of Financial Legislation in the United States; French, German or Latin; Oratory; Elective.

Senior Class.

FIRST SEMESTER.— History of the Laboring Classes; Elective; Elective; Elective.

SECOND SEMESTER.— Sociology; Elective; Elective; Elective.
COURSE IN MECHANICAL ENGINEERING.

[E. Electrical Engineering; M. Mill Engineering; S. Steam Engineering; H. Hydraulic Engineering.]

Freshman Class.

First Semester.—Solid Geometry; Mediaeval and Modern European History; French; Mechanical Drawing.

Second Semester.—Trigonometry; Rhetoric; French; Forging (ten hours).

Sophomore Class.

First Semester.—Higher Algebra; French; Physics; Descriptive Geometry (ten hours).

Second Semester.—Analytical Geometry and Calculus; French; Mechanism; Machine Shops.

Junior Class.

First Semester.—Calculus; Engineering Mechanics; Analytic Mechanics; Pattern Making and Foundry Work.

Second Semester.—Motors; Power Transmission (three hours); Hydromechanics (Mill, Hydraulic and Civil Engineering students), two hours; Thermodynamics (Steam and Electrical Engineering students), two hours; Designing; Elective.

Senior Class.

First Semester.—Water Power Development (H. and M.); Electrodynamics (E.), or Steam Engine Details and Boiler Practice (S.), or Mill Architecture (M.), or Sanitary Engineering (H.); Shop work; Chemistry (E. and S.); Elective.

Second Semester.—Contracts and specifications (two hours); Foundations and Masonry (three hours); Elective; Thesis; Elective.