

EIGHTH BIENNIAL REPORT

OF THE

BOARD OF TRUSTEES

OF THE

IOWA STATE AGRICULTURAL COLLEGE

AND FARM,

MADE TO

THE GOVERNOR OF IOWA,

FOR THE YEARS 1879 AND 1880.

[PRINTED BY ORDER OF THE GENERAL ASSEMBLY]

DES MOINES:
F. M. MILLS, STATE PRINTER.
1879.

STATE AGRICULTURAL COLLEGE, }
AMES, Iowa, December 1, 1879. }

TO HIS EXCELLENCY, JOHN H. GEAR:

IN accordance with the statute defining the duties of the Secretary of the Board of Trustees of the Iowa State Agricultural College and Farm,, I have the honor to transmit herewith the Eighth Biennial Report of said Board.

E. W. STANTON, *Secretary.*

REPORT OF THE BOARD OF TRUSTEES.

To the General Assembly of the State of Iowa:

As members of the Board of Trustees of the Iowa Agricultural College, we beg leave to report the continued growth and prosperity of that institution. During the last two years it has, in our opinion, made marked progress in the line of work for which it was established, and is each year fulfilling more and more completely the purpose prescribed by the Congressional grant from which it derives its endowment. We deem it the duty of the State to encourage its further development. To render such development possible, it is absolutely necessary that the Legislature provide additional buildings; without them the institution cannot grow beyond its present capacity. The State is bound under its contract with the National Government to meet this pressing want, for, in accepting the land grant from Congress, the State pledged itself to furnish all needed buildings. We, therefore, earnestly ask the Legislature to fulfill this contract of the State with Congress, by making appropriations for the following indispensable improvements:

<i>First</i> —For a building to be used as an experimental kitchen and for recitation rooms.....	\$ 5,000.00
<i>Second</i> —For a building to be occupied by the Veterinary School, Botanical Department, and School of Agriculture.....	5,000.00
<i>Third</i> —For a small building to be used as a feeding barn by the Professor of Experimental Farming.....	1,300.00
<i>Fourth</i> —For swine-houses, corn-cribs and poultry-houses.....	1,200.00
<i>Fifth</i> —For four boarding cottages, to meet the demand for additional room.....	6,000.00
<i>Sixth</i> —For vault and fire-proof safe.....	1,500.00

The Board respectfully urge that the pressing need of the above improvements will be manifest from the following facts, and they refer

for full details to the report of the President of the College, which they heartily indorse. The Department of Domestic Economy is wholly destitute of suitable rooms for instruction in cookery, laundry work, etc. The Department of Botany and Veterinary Science are at present temporarily located in the house formerly occupied by the President of the College. This house does not furnish suitable quarters for these departments, and is needed for occupancy by officers of the institution. The two feeding-houses are indispensable to the successful conducting of experiments for which the Board have now provided an able Professor, whose salary is to be paid from the funds of the College. The farm is lacking, and has always lacked, a poultry-house and adequate corn-cribs. It is important that the College should be provided with some safe depository for its funds and valuable books and papers.

In addition to appropriations for these much needed improvements, we are compelled to ask for a small sum to cover expenses concerning the necessity of which there can, we think, be no question upon the part of your honorable body.

For meeting the expenses connected with the handling of College lands, and for making repairs upon College buildings, we earnestly recommend an annual appropriation of \$1,500. The College has no funds from which it can pay these necessary expenses. In section three of the act of Congress under which the State received the grant of public lands which constitutes the endowment of the College, it is expressly stipulated that all the expenses of management and superintendence of said lands, and all the expenses incurred in the management and disbursement of the moneys received therefrom shall be paid by the State out of the treasury of the State. It is also, in section five of the same act, stipulated that "no portion of said fund, nor the interest thereon, shall be applied either directly or indirectly under any pretense whatever, to the purchase, erection, preservation, or repair of any building or buildings." Thus it will be seen that the College is prohibited from using any of its funds for the purposes mentioned. In 1868 the Board of Trustees invested the surplus interest-money then on hand and not needed for the support of the College, in lands known upon the books of the College as Sioux City lands. The money received from the lease of these lands has been used by former Boards, under the plea of urgent necessity, as a contingent fund, from which has been paid all the expenses connected with the management of the lands not borne by the lessees, and also the ordinary repairs of College

buildings. Such use of this fund has been regularly reported to the Legislature and received its tacit approval. It is, however, an evident misapplication of the funds of the institution. The expense of managing the lands must be borne by the State. So says the contract with the National Government to which the State is a party.

The Interest Fund cannot be used for repairs, neither can it be loaned and the interest thus received be applied for that purpose, for the law expressly declares that the Interest Fund shall not be used either *directly* or *indirectly* for the purchase, erection, preservation or repair of any building.

The question of the right of the College to use the interest arising from the loaning of accumulated interest money for the purposes mentioned above, was submitted by this Board to the Attorney-General, and he decided, in an opinion presented at their meeting in May, 1879, that such use of said fund would be illegal. Senator Kirkwood, a former member of the Board of Trustees, held the same opinion, and so reported to the Legislature in the Sixth Biennial Report of this College. Believing, as we do, that to apply any of the funds under our charge to the purposes mentioned would be an illegal use of such funds and a plain violation of our official oaths, we have no other recourse than to ask the Legislature to appropriate a sufficient sum to meet these *absolutely necessary* expenses.

AMENDMENT SUGGESTED TO SECTION 1617 OF CODE.

Section 1617 of the Code requires that all moneys arising from the sale of Endowment Fund land shall be paid into the State Treasury and shall be invested by the State Treasurer, subject to the approval of the Executive Council, in stocks of the United States, or some other safe stocks, yielding not less than five per centum on the par value of the stocks, and that the money arising from the interest on said stocks shall be paid over to the Board of Trustees. It will be seen that the section does not provide that the treasurer shall make report of such investments, or the interest received therefrom, to the Board of Trustees. We deem such report necessary in order that the Board may have such knowledge of the nature and amount of its resources and income as to enable it intelligently to make the annual appropriations for defraying the expenses of the different departments. At present this portion of the funds of the institution is managed by an officer who is not required to render any account of such management to this

Board. We have, therefore, no direct means provided by law for ascertaining the amount invested, the probable income to be expected from that source, or whether the amounts paid over to the Board are the correct amounts due from the interest collected on said fund.

We respectfully suggest that the section be so amended as to make it the duty of the State Treasurer to render to this Board quarterly reports of the condition of the College funds in his charge, specifying in said report any changes in the investment of the original fund during the quarter, and giving in detail the interest received from investments made. We further recommend that the time of making these reports be so fixed that one of them shall cover the quarter ending with the second Wednesday of November, the close of the fiscal year of the College.

For detailed statement of the work done and progress made in the different departments of the College, we refer you to the accompanying report of the President and Faculty.

J. N. DIXON.
H. G. LITTLE.
GEO. H. WRIGHT.
BUEL SHERMAN.
WM. McCLINTOCK.

REPORT OF THE PRESIDENT.

To the Honorable Board of Trustees of the Iowa Agricultural College:

Gentlemen—In obedience to the statute which defines the duties of the President, I submit for your consideration my Eighth Biennial Report.

The Iowa Agricultural College has completed its eleventh year since the formal opening in March, 1869. From its dedication, at that date, to the cause of industrial learning, to the close of its last commencement, it has been striving steadily and successfully to accomplish the purpose set forth in the national law, which at once constitutes its charter and supplies its endowment. Whoever studies its brief history will not fail to find therein all the indications of a uniform and healthy advancement—an advancement which was never for a moment checked by the bitter hostility encountered in its earlier years.

But the advantages under which the Iowa Agricultural College has attained, in so short a period, a prosperity reached by no other similar institution in the land, may be embodied in a few explicit statements

1. The policy of the Board of Trustees has, from the beginning, been in uniform harmony with the object for which the College was founded.
2. The growth of the College itself is simply the development of a plan of organization devised in conformity with Congressional law and adopted at its opening.
3. The several faculties are composed of men who are fitted not only by study and experience, but by their enthusiasm, for the special lines of instruction they have in charge.
4. In all matters that concern the welfare and progress of the institution its officers are in harmony.
5. The people are manifesting a preference, which increases year

by year, for that kind of education wherein practical ability transcends mere verbal adroitness.

6. The courses of study are arranged with direct reference to their practical bearing on the employments and duties of future life.

7. Last, but by no means least, the Trustees have managed the endowment fund with a care so uniformly wise and watchful that the annual income of the Iowa Agricultural College exceeds in amount that of any other national industrial school in the country.

With similar brevity a glimpse may be given of the results already attained. Premising that, from the nature of the enterprise, these results will increase in a higher ratio every year, we point with pride to the fact that the Agricultural College has now one hundred and sixty-five graduates who are engaged, with credit to themselves, in the various pursuits and professions for which they had received a liberal preparation. Farmers, stock-breeders, horticulturists, teachers, editors, engineers, master-mechanics, architects, and professors in this and other industrial institutions, may be found among their number. And while all are doing creditable work as graduates of the College, some, though still young, are holding positions of influence and trust which exceptional ability qualifies them to fill.

But of those who enter the Agricultural College, only about one-sixth are able, from lack of means and other reasons, to complete one of the courses and attain graduation. Those students, however, who leave before the closing year, gain their measure of benefit from the industrial studies they have pursued. We have, consequently, not less than a thousand under-graduates in the State and the West, whose character and habits of labor have been more or less influenced by the instruction received at the College. To these results, which the Congressional law insists upon as the leading object of the enterprise, may be added the many ways in which the Agricultural College is aiding, directly or indirectly, the industries of the State. Among these may be mentioned the experiments made in feeding, experiments in horticultural products and processes, the introduction of Russian fruits, and the printing and wide circulation of the College Quarterly, which is the organ of all the industrial departments.

APPARATUS AND MEANS OF INSTRUCTION.

Many of the twelve schools of instruction into which the institution is conveniently divided, are well supplied with facilities for illus-

tration, purchased from time to time with an appropriation from the interest fund.

The library with its six thousand well bound volumes, most of which treat of subjects related to industrial art and science, contributes its indispensable help to all the schools; the printing office, furnished with its cases of type, its jobber and steam press; the two shops, one for working in wood, and the other in iron, both fitted up with suitable machinery and tools; the chemical laboratory, wherein a hundred students find means to conduct chemical experiments; the physical and botanical and horticultural laboratories, each having its appropriate collection; the general museum; the stables, with their pure blooded animals; the veterinary school with its temporary hospital, all together go to make up the equipment without which no institution like this can accomplish its purpose.

THE FUNDS OF THE AGRICULTURAL COLLEGE.

It is a marvelous fact that not a few citizens of Iowa who are intelligent in other matters, still cling to the delusion that the Agricultural College is supported wholly by taxes imposed on the people. This remarkable error which reveals itself every year despite our constant efforts to throw the light of truth upon it, will justify a brief repetition of the facts in the case, facts which are indeed trite enough to the friends of the institution.

In 1862, Congress enacted a law offering to every State in the Union a grant of lands at the rate of thirty thousand acres to each congressional senator and representative from such State, for the maintenance of one or more colleges wherein the leading sciences taught shall be related to agriculture and the mechanic arts. This act imposed on each State accepting the grant the following conditions, namely: The fund arising from the disposal of the lands so received should be sacredly kept from diminution, and the interest accruing therefrom should be applied to meet all the current expenses of the college described, while the State, on its part, should pay from its own treasury the expense of handling the lands thus granted and erect and keep in repair all necessary buildings.

Our State of Iowa at once accepted this munificent offer and thereby bound itself, as the trustee of a noble endowment, to fulfill all the accompanying conditions. Under a contract between the nation and the State, the latter in 1864, received in trust for establishing an Ag-

gricultural College, 204,309 acres. These lands by virtue of a project subsequently adopted, were offered for lease instead of sale. The lessee was required to pay annually, in advance, eight per cent on the appraised value of the land, with the right to purchase at the end of ten years. In case of failure to pay the interest when due the land, with all the improvements, reverts to the College.

A quick demand for the land on these terms showed at once the wisdom of the project, and brought an immediate revenue to the institution. These rents together with the interest on the sum of \$71,000 accruing from the sale of lands whose leases have expired, make up the present income of the Agricultural College, amounting in the aggregate, to \$40,000 a year.

The current expenditures, such as salaries of officers, management of the farm, gardens, stock; the purchase of implements, apparatus, books and all other collections, are paid from this annual fund. But the erection and repair of all buildings essential to the success of the enterprise, and all the expense of disposing of the lands, whether by rent or sale, and the care of the permanent fund created thereby, has been assumed by the State under the terms of an express contract.

PRESSING NEEDS OF THE AGRICULTURAL COLLEGE.

The wants of every new institution will increase in proportion as its growth advances. The progress of the Agricultural College during the last five years has been uniform and constant, and its necessities have multiplied in similar ratio. In fulfillment of the contract made when the Congressional grant was accepted, the Legislature has hitherto supplied these necessities in a liberal spirit. Appropriations for additional buildings have been made whenever the further development of the enterprise demanded their erection. In this way the stock barn, the work-shop, and the three laboratories were planned and built. And every dollar expended by the State for the buildings occupied by the College, has been invested in accordance with a clear and well-defined contract.

Seventeen years ago Congress offered this State a grant of lands amounting to over two hundred and four thousand acres, the proceeds of which should maintain an industrial college (provided the State should meet all the expense of handling the land and of erecting all the necessary buildings). This proposal was offered by the nation and accepted by the State. On the part of the nation, 204,309 acres were

made over to Iowa, which now bring to the College an income, either by rent or interest, of \$40,000 a year. The State, on its part, has supplied buildings needed up to 1878, but has failed to fulfill its contract to provide means to keep them in repair and to meet the expenses of handling the land.

The College now asks the Legislature for a complete fulfillment of this express contract. Under the urgent necessity which it would be a violation of their oaths of office to hide, the Trustees cannot do less than to report to the coming Assembly that the State has neglected to furnish the means for repairing its buildings according to contract; that the College has now three departments; organized to meet a great public demand, which are utterly lacking in the buildings indispensable to their operations; that the arrangement they have made for experiments in farming under Professor Knapp; will require further facilities for feeding, and that the constantly increasing numbers who apply for admission to the College, call imperatively for a further supply of room for their accommodation. But let us look at these unquestionable needs individually.

EXPERIMENTAL KITCHEN.

Three years ago the department of Domestic Economy was organized, and an experimental kitchen opened in a small basement room, where the young ladies of a single class were taught the theory and practice of cooking and other household arts. The pupils increased in number and became enthusiastic. The department was at once greeted from every quarter with the indications of popular favor. The Iowa journals gave it their emphatic commendation, and letters of inquiry and encouragement were received from nearly every State in the Union. Yet the utmost that we could do for the first experimental kitchen ever opened in any college was to add another little room for it in the basement, where the girls were compelled to practice the culinary art in small detachments. It has been evident throughout the year just closed, that this interesting and highly useful branch of our enterprise must either have rooms of its own in a separate building or be hopelessly dwarfed; and this latter alternative cannot be contemplated for a moment. No other course is left but to ask the Legislature to provide the means for erecting a new building wherein the experimental kitchen shall have abundant rooms for all its various operations.

THE DEPARTMENT OF BOTANY AND VETERINARY SCIENCE.

Beside the extreme scantiness of space for the experimental kitchen, it was found last year that the recitation rooms in the main building were inadequate to the number of classes daily reciting. We resorted to every possible expedient to make them answer for the work of the year. One department was, however, wholly destitute of a place for its exercises. At the close of the year the President, under the pressure of hard necessity for more room, gave up the residence assigned to his family, went into narrower quarters and commenced building for himself. On the opening of the term last spring, the departments of Botany and Veterinary Science took possession of the vacated dwelling, and have conducted their operations in its rooms throughout the year.

There are, however, very serious reasons why this expensive dwelling should not permanently serve the purpose for which it was temporarily employed. It is, in the first place, a grave question whether, having been built expressly for the residence of an officer, it can be legally given over to be used for laboratories and lecture rooms. It cannot, in the next place, be profitably devoted to such ends without expensive modifications, which would greatly injure its costly finishing. It is, moreover, greatly needed by officers of the College, for a residence. And, finally, buildings could be provided for these departments at far less cost to the State.

For such reasons, it seems imperative that a new building should be erected for the Veterinary School which shall contain, in the second story, a suite of rooms adequate to the wants of the School of Botany.

THE SCHOOL OF VETERINARY SCIENCE

Has been fully organized this year and is now prepared to give the complete course of instruction necessary to the graduation of veterinary physicians. It has opened with great promise, and enjoys in the highest degree the public favor. It is, moreover, well supplied with other equipments, but how can it meet a great public want without a local habitation?

BOARDING COTTAGES.

Under a pressure that cannot be withstood, we are compelled to ask also a limited sum to be expended in the building of cottages for students. It is beyond question that the addition, with a moderate out-

lay, of four or six such tenements would accommodate from seventy to ninety students, who cannot otherwise secure the advantages of a higher education. Plans for plain, substantial dwellings will be drawn and careful estimates of cost made by our architect, and the Legislature made fully acquainted with this pressing need.

Respecting the needs of his department, Professor Bessey writes as follows:

"The pressure for more rooms for this department was temporarily met a year ago by assigning it a portion of a dwelling house upon the grounds vacated for that purpose. This supplied good rooms, although too small for the large classes in botany, which often reach or exceed one hundred. The need of this dwelling house for its legitimate purpose, makes it necessary again to provide for the classes and apparatus of this department. There are no available class-rooms in the other College buildings, large enough to accommodate the classes in botany; neither can rooms be obtained for the laboratory, herbarium and study, without occupying and making considerable changes in the rooms in the main building, now filled with students.

"The department must have four rooms, viz.; (1) a class or lecture room large enough to comfortably seat one hundred or more students; (2) a well-lighted laboratory, large enough to contain the tables and cases needed in the microscopical study of plants—as this is work in which no crowding is possible, the room must be of good size, and as good light is absolutely necessary, it must have the proper aspect; (3) a room for the herbarium and cabinet of economic botany—these collections are growing and are already of such a size as to require a large room; (4) a professor's study and library—in this the student should have ready access to the works of reference he needs while making his investigations in the laboratory and herbarium."

HOUSES FOR EXPERIMENTATION IN FEEDING.

The appointment of S. A. Knapp to the chair of Practical and Experimental Agriculture, secures earnest and successful endeavor in the important department of farm experiments. This part of the enterprise is of vital moment to the State. It may be safely said that every farmer of Iowa is an annual loser from lack of *perfect management* either in crop raising or in feeding for butter, beef, or pork. Moreover, not one farmer in a hundred knows the very best variety of seed for the crop he proposes to raise, and very few appreciate the fact

that perfectly sound and healthy seed of whatever kind, is indispensable to the same qualities in the ripened grain. Now the best processes for an Iowa climate and soil, the most profitable stock for given purposes in this prairie State, the most economical materials and methods in feeding, and the most productive varieties of seed are all to be determined by accurate and careful experiments, whereof the results shall be published and sent broadcast.

The Agricultural College has long desired to enter fully upon this great work, but, until now, the right man and adequate means for the enterprise were not forthcoming. Professor Knapp will commence systematic experimentation next spring and will make a public report of the outcome every fall thereafter. But, after defraying all the expenses of these experiments which can be legally paid out of the College interest fund, there will remain a limited outlay for which the State must provide. Two feeding barns of moderate size, one for hogs and the other for cattle, will be indispensable for testing the value of different foods under different methods of preparation. The comparatively small expense of erecting these buildings will fall upon the State, and no appropriation which the Legislature ever made will be surer of profitable returns.

SUM TOTAL.

The list of improvements mentioned above might seem to indicate that the aggregate of appropriations which the Trustees ask for will be large. To this we may reply that the College desires the State, in meeting its necessities for further buildings, to furnish only such moderate means as will secure strength and durability, rather than esthetic effect, and the sum total of the appropriations sought will consequently be comparatively moderate.

A. S. WELCH, *President.*

FINANCIAL REPORTS.

APPROPRIATIONS OF THE SEVENTEENTH GENERAL ASSEMBLY.

REPORT OF COMMITTEE APPOINTED TO CONSTRUCT COLLEGE SEWER.

To the Board of Trustees:

Your honorable body at its meeting in November, 1877, ordered:

"That the Legislature be memorialized to appropriate the sum of \$1,500 for building a new sewer. It being, however, a work that must be completed during the winter vacation, and one imperatively necessary for the health of students and others occupying the building, we would recommend that the College authorities borrow the money necessary to construct said sewer, and reimburse themselves when the appropriation shall be made by the Legislature to pay for said work; and that Professors Budd and Beal be authorized to make all purchases of material and superintend all work necessary to the construction of said sewer."

Your committee would respectfully report that the work could not be commenced until after the close of the college in November, and the utmost despatch was required to complete the sewer in advance of severe winter freezing.

The contract for furnishing the cement pipes was awarded to the Iowa Carbonated Stone Pipe Company, of Des Moines.

The work of excavating and filling was divided into allotments and let to as many parties, in order to hasten the work.

The most approved principles of sanitary engineering have been carefully considered during all the stages of construction.

Appended will be found an exhibit of receipts and expenditures. As required by law, duplicate receipts have been taken for all moneys expended, which have been duly forwarded to the State Auditor.

[Signed]

J. L. BUDD, }
F. E. L. BEAL, } *Committee.*

EXHIBIT A.

RECEIPTS.

Amount received from State Treasurer on account of appropriation for new sewer.....\$1,472.25

EXPENDITURES.

1877.			
Vou. 1.	Dec. 6.	To paid E. Whalen for work.....	\$101.50
Vou. 2.	Dec. 7.	To paid freight on material	40.32
Vou. 3.	Dec. 8.	To paid expenses of J. L. Budd purchasing tools.....	2.00
Vou. 4.	Dec. 8.	To paid J. Erb for work.....	30.00
Vou. 5.	Dec. 10.	To paid J. K. Cameron for work.....	44.25
Vou. 6.	Dec. 10.	To paid Iowa Carbonated Stone Pipe Company for tile....	628.80
Vou. 7.	Dec. 29.	To paid E. Whalen for work.....	38.87
Vou. 8.	Dec. 29.	To paid freight on material.....	54.60
Vou. 9.	Dec. 29.	To paid S. J. Anderson for work.....	5.47
1878.			
Vou. 10.	Jan. 2.	To paid G. K. Cameron for work	11.25
Vou. 11.	Jan. 2.	To paid H. Milligan for work	2.04
Vou. 12.	Jan. 12.	To paid L. L. Eastwood for work	1.12
Vou. 12.	Jan. 12.	To paid J. Gilmore for work.....	3.76
Vou. 13.	Jan. 12.	To paid J. Sexton for work	2.70
Vou. 14.	Jan. 12.	To paid college farm for lumber	8.00
Vou. 15.	Jan. 12.	To paid H. W. Tripp for work	50.00
Vou. 16.	Jan. 12.	To paid J. Wood for work.....	43.75
Vou. 17.	Jan. 12.	To paid J. Erb for work	11.25
Vou. 18.	Jan. 16.	To paid Nichols & Maxwell for hauling	23.99
Vou. 19.	Feb. 8.	To paid for pipe material	16.87
Vou. 20.	March 10.	To paid W. Clark for cement	3.00
Vou. 21.	April 16.	To paid sundry persons for labor	9.40
Vou. 22.	May 11.	To paid M. Gifford for work	5.98
Vou. 23.	May 11.	To paid W. Whited for work.....	.81
Vou. 24.	May 16.	To paid Lamb & Son for lumber.....	3.50
Vou. 25.	May 16.	To paid W. G. Wright for material	43.74
Vou. 26.	May 16.	To paid Bingham & Barroll for material	3.75
Vou. 27.	June 5.	To paid J. Wood for work	1.75
Vou. 28.	June 5.	To paid S. M. Pedrick for work	1.62
Vou. 29.	June 12.	To paid M. Gifford for work	4 95
Vou. 30.	Aug. 3.	To paid college workshop for material	26.94
Vou. 31.	Aug. 6.	To paid E. Whalen for work	18.00
Vou. 32.	Aug. 7.	To paid W. G. Wright for material.....	22 90
Vou. 33.	Aug. 26.	To paid E. Whalen for work	6.00
Vou. 34.	Sept. 2.	To paid Iowa Carbonate Stone Pipe Company for tile....	11.70
Vou. 35.	Nov. 13.	To paid college farm for use of tools.....	15.00
Vou. 36.	Nov. 13.	To paid freight on material.....	11.70
Vou. 37.	Nov. 13.	To paid Iowa Carbonated Stone Pipe Company for tile....	60.75
Vou. 38.	Nov. 13.	To paid B. Read for cement.....	1.25
Vou. 39.	Nov. 13.	To paid E. Whalen for work.....	50.00
Vou. 40.	Nov. 13.	To paid Nichols & Maxwell for hauling	2.50
1879.			
Vou. 41.	Jan. 1.	To paid F. E. L. Beal's expenses buying material.....	2.50
Vou. 42.	Jan. 1.	To paid Chavannes & Whalen for work.....	33.50
Vou. 43.	Jan. 7.	To paid J. Sexton for work	5.47
Total.....			1,472.25

REPORT OF COMMITTEE APPOINTED TO CONSTRUCT HORTICULTURAL LABORATORY.

To the Board of Trustees:

The act of the Seventeenth General Assembly making an appropriation of the sum of \$2,500.00 for the Horticultural Laboratory, not being available by the special provisions of the Act until 1879, induced your Honorable Body at its meeting in May, 1878, to appoint the undersigned as a committee to arrange plans for and erect the same, during the summer of 1878, with funds borrowed for the purpose. Your committee was met on the start with the usual difficulties growing out of a totally inadequate appropriation. The Legislature appropriated only five-twelfths of the amount—based upon careful estimates—asked for by the Board. This reduction compelled the committee to plan a cheap wooden structure for class room, office, seed room, specimen room, store room, etc., with attached propagating pits, grafting room, etc., of restricted size and cheap construction.

In carrying out these modest plans, neither creditable to the College nor the State, the appropriation would still have been inadequate had not firms, in Clinton, Iowa, generously furnished the lumber, doors, sash, etc., at prices below dealers rates. Active competition also permitted letting the contracts for labor at hard times prices.

Appended will be found an exhibit of receipts and expenditures.

As required by law, duplicate receipts have been taken for all moneys expended, which have been duly forwarded to the State Auditor.

[Signed]

JOHN N. DIXON, }
 BUEL SHERMAN, } *Committee.*
 J. L. BUDD, }

EXHIBIT B.

RECEIPTS.

Amount received from State Treasurer on account of appropriations for Horticultural Laboratory..... \$2,500.00

EXPENDITURES.

1878.			
Vou. 1.	June 5.	To paid L. Whalen for work.....	\$ 21.22
Vou. 2.	June 5.	To paid J. Sexton for work.....	28.08
Vou. 3.	June 14.	To paid P. L. Porter for 27,000 brick.....	202.50
Vou. 4.	June 14.	To paid W. Lindsay for work.....	40.00
Vou. 5.	June 25.	To paid C. Lamb & Son for lumber.....	389.05
Vou. 6.	June 26.	To paid freight on material.....	67.77
Vou. 7.	June 26.	To paid J. Sexton for work and material.....	14.15
Vou. 8.	June 26.	To paid W. Clark for material.....	26.69
Vou. 9.	July 25.	To paid Alvord & Basket on contract building.....	75.00
Vou. 10.	July 29.	To paid J. L. Hines, on painting contract.....	10.00
Vou. 11.	Aug. 8.	To paid Curtis & Bros., material.....	109.71
Vou. 12.	Aug. 8.	To paid Alvord & Basket on contract, building.....	125.00
Vou. 13.	Aug. 8.	To paid J. Basket for plastering.....	10.50
Vou. 14.	Aug. 9.	To paid freight on material.....	27.88
Vou. 15.	Aug. 14.	To paid freight on material.....	4.05
Vou. 16.	Aug. 14.	To paid Nichols & Maxwell, hauling.....	11.40
Vou. 17.	Aug. 14.	To paid J. Elliot for material.....	1.75
Vou. 18.	Aug. 15.	To paid J. Lindsay for work.....	50.00
Vou. 19.	Aug. 19.	To paid P. L. Porter for brick.....	75.00
Vou. 20.	Aug. 22.	To paid Alvord & Basket for work.....	14.50
Vou. 21.	Aug. 24.	To paid Hutchins & Co. for material.....	101.00
Vou. 22.	Aug. 29.	To paid Chamberlain & Clark for material.....	48.48
Vou. 23.	Aug. 29.	To paid W. G. Wright for material.....	72.87
Vou. 24.	Aug. 29.	To paid Tilden & McLain for material.....	75.56
Vou. 25.	Aug. 30.	To paid J. Sexton for work.....	13.40
Vou. 26.	Sept. 2.	To paid C. Lamb & Son for material.....	145.77
Vou. 27.	Sept. 4.	To paid E. Whalen for work.....	12.50
Vou. 28.	Sept. 9.	To paid J. S. Barning for work.....	22.05
Vou. 29.	Sept. 9.	To paid J. L. Hines on painting contract.....	25.00
Vou. 30.	Sept. 14.	To paid T J. Andre for work.....	4.40
Vou. 31.	Sept. 14.	To paid F. Turner for work.....	12.35
Vou. 32.	Sept. 14.	To paid W. Whitford for work.....	1.75
Vou. 33.	Sept. 14.	To paid L. L. Eastwood for work.....	8.84
Vou. 34.	Sept. 14.	To paid J. Sexton for work.....	9.68
Vou. 35.	Sept. 14.	To paid J. L. Hines on painting contract.....	34.00
Vou. 36.	Sept. 16.	To paid Nichols & Maxwell, hauling.....	7.85
Vou. 37.	Sept. 16.	To paid freight on material.....	9.60
Vou. 38.	Sept. 16.	To paid freight on material.....	.67
Vou. 39.	Sept. 21.	To paid freight on material.....	.64
Vou. 40.	Sept. 28.	To paid P. L. Porter for brick.....	43.00
Vou. 41.	Oct. 14.	To paid E. Whalen for work.....	3.00
Vou. 42.	Oct. 14.	To paid Crane Bros. for material.....	9.59
Vou. 43.	Oct. 17.	To paid E. Patterson for work.....	7.50
Vou. 44.	Oct. 17.	To paid freight on material.....	.25
Vou. 45.	Oct. 13.	To paid E. Patterson for work.....	29.75
Vou. 46.	Oct. 18.	To paid L. L. Eastwood for work.....	4.59

Vou. 47.	Oct. 23.	To paid P. L. Porter for brick.....	18.85
Vou. 48.	Oct. 23.	To paid Thomas & McLain for material.....	25.47
Vou. 49.	Oct. 23.	To paid G. W. Wright for material.....	18.93
Vou. 50.	Oct. 26.	To paid D. Basket for plastering.....	102.75
Vou. 51.	Oct. 26.	To paid J. Basket for lathing.....	7.41
Vou. 52.	Nov. 5.	To paid Boyd & Chapman for material.....	10.00
Vou. 53.	Nov. 5.	To paid Nichols & Maxwell, hauling.....	2.40
Vou. 54.	Nov. 5.	To paid Lamb & Son for lumber.....	116.35
Vou. 55.	Nov. 13.	To paid College Farm for work.....	14.70
Vou. 56.	Nov. 13.	To paid L. L. Eastwood for work.....	12.32
Vou. 57.	Nov. 13.	To paid Chamberlain & Clark for material.....	9.82
Vou. 58.	Nov. 13.	To paid Thomas & McLain for material.....	2.33
Vou. 59.	Nov. 13.	To paid J. L. Budd, expenses and amount paid workmen ..	47.45
Vou. 60.	Nov. 11.	To paid J. L. Hines for plastering.....	40.00
Vou. 60.	Dec. 5.	To paid W. S. Lindsay for work.....	36.93
1879.			
Vou. 61.	Jan. 1.	To paid Lamb & Son for lumber.....	2.60
Vou. 62.	Jan. 1.	To paid Bingham & Barroll for material.....	2.88
Vou. 63.	Jan. 1.	To paid Lamb & Son for lumber.....	6.25
Vou. 64.	Jan. 1.	To paid J. Basket for work.....	9.00
Vou. 65.	Jan. 8.	To paid J. Basket for work.....	5.82
Total.....			2,500.00

REPORT OF THE TREASURER.

[FOR THE YEAR ENDING NOV. 13, 1878.]

The following are the Receipts and Expenditures on account of the different College Funds for the Year ending November 13, 1878.

PERMANENT ENDOWMENT FUND.

RECEIPTS.

	Dr.	Ck.
Balance from last year.....		\$68,782.87
Amount from sales of College lands		1,580.00

EXPENDITURES.

Total amount paid State Treasurer for investment	\$70,362.87	
	70,362.87—	70,362.87

CONTINGENT PRINCIPAL FUND.

Amount from sale of Sioux City lands.....		1,800.00
Amount on hand	1,800.00	

INTEREST FUND.

RECEIPTS.

Balance from last year.....		216.39
Amount from G. W. Bassett, College land agent		29,992.48
Amount from Boarding Department, an old debt		404.83
Amount from State Treasurer, interest on investments.....		5,417.74
Amount from Workshop, balance over expenditures		308.74
Amount from Farm Household, balance over expenditures.....		75.72
Total receipts		36,415.90

EXPENDITURES.

Amount transferred from Contingent Principal Fund.....	360.00	
Paid for Chemical Laboratory.....	205.25	
Paid for College Quarterly	274.60	
Paid for Farm Department	1,982.79	
Paid for Horticultural Department.....	991.46	
Paid for salaries.....	28,083.51	
Paid for museum.....	153.96	
Paid for civil engineering	112.03	
Paid for armory	300.00	
Paid for library	688.62	
Paid for contingent expenses	1,688.04	
Paid for ornamental grounds.....	607.28	
Paid for experimental kitchen	146.81	
Paid for printing office	143.36	
Paid for fires and lights	183.37	
Paid for Veterinary Department	128.77	
Paid for Botany and Entomology.....	311.28	
Paid for Physical Laboratory.....	247.80	
Total expended.....	36,608.93	
Amount overdrawn.....		193.03
	36,608.93—	36,608.93

CONTINGENT FUND.

RECEIPTS.

Balance from last year.....	1,340.50
Amount from leases of Sioux City lands.....	2,669.84
Total receipts	4,010.34

EXPENDITURES.

Paid College Workshop, per order of Board	86.37
Paid J. L. Geddes for barn	64.00
Paid E. W. Stanton's expenses to Ft Dodge.....	6.70
Paid G. W. Bassett salary and blank book	30.55
Paid G. W. Bassett salary	37.50
Paid for College repairs	33.32
Paid W. D. Lucas for exchange	100.00
Total expended	358.44
Amount unexpended	3,651.90
	4,010.34— 4,010.34

BOARDING DEPARTMENT.

RECEIPTS.

Balance from last year	1,355.63
Amount from students and others for board.....	14,572.98
Total receipts	15,928.61

EXPENDITURES.

Paid on account of supplies, labor and furnishing	14,930.45
Amount from increase of inventory	37.45
Amount unexpended	960.71
	15,928.61— 15,928.61

INTEREST ON NOTES.

Balance from last year.....	29.10
Amount from interest on sundry notes	130.30
Amount unexpended	149.40
	149.40— 149.40

DONATIONS.

RECEIPTS.

Balance from last year	155.00
Amount from land sold	200.00
Total receipts	355.00

EXPENDITURES.

Paid J. L. Budd's expenses to Des Moines.....	46.60
Amount unexpended	308.40
	355.00— 355.00

SEED APPROPRIATION.

Balance from last year.....	141.67
Amount unexpended	141.67

FURNACE PIPING APPROPRIATION.

Balance from last year.....	150.00
Amount unexpended	150.00

DIPLOMAS.

RECEIPTS.

Balance from last year	25.00	
Amount received for diplomas	105.00	
Total receipts	180.00	

EXPENDITURES.

Paid for diploma material	119.55	
Amount unexpended	10.45	
	130.00	130.00

FARM HOUSE PAINTING APPROPRIATION.

RECEIPTS.

Balance from last year	\$ 1.45	
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EXPENDITURES.

Paid J. J. Bosquet's bill of paint	\$.68	
Amount unexpended77	
	1.45	1.45

SCHOOL BOOKS.

Dr., balance from last year	225.41	
Amount received from school books		40.25
Balance due from school book department		185.16
	225.41	225.41

BILLS RECEIVABLE.

Balance from last year	2,381.99	
Notes received during 1878	218.00	
Total notes received	2,599.99	
Notes paid during the year		2,053.49
Amount of notes on hand		546.50
	2,599.99	2,599.99

STATE TREASURER.

Balance from last year, sales of land	68,782.87	
Amount from same source in 1878	1,580.00	
Total in hands of treasurer	70,362.87	

NEW SEWER.

RECEIPTS.

Amount from J. L. Budd, borrowed	1,472.25	
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EXPENDITURES.

Amount paid for work and material	1,425.78	
Amount unexpended	46.47	
	1,472.25	1,472.25

HORTICULTURAL LABORATORY.

RECEIPTS.

Amount received from J. L. Budd, borrowed	2,500.00	
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EXPENDITURES.

Paid for work and material	2,436.52	
Amount unexpended	63.48	
	2,500.00	2,500.00

PERSONAL ACCOUNTS.

Amount due from sundry persons	554.80
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CASH.

RECEIPTS.

Balance from last year	184.65
Amount received from all sources	65,065.28
Total receipts	66,149.93

EXPENDITURES.

Amount paid out as per vouchers	60,346.17
Balance cash on hand	5,803.76
	66,149.93
	66,149.93

The cash on hand belongs to the following accounts:

Boarding Department	\$ 960.71
New Sewer	46.47
Horticultural Laboratory	63.48
Contingent Principal Fund	1,800.00
	2,870.66

Balance available for any purpose to which the Board may desire to appropriate it

	2,933.10
Total cash on hand	5,803.76

SUMMARY.

	Dr.		Cr.
School books	\$ 185.16	Boarding department	\$ 960.71
State treasurer	70,362.87	New sewer	46.47
Bills receivable	546.50	Interest on notes	149.40
Cash on hand	5,803.76	Contingent fund	3,651.90
Personal accounts	554.80	Furnace piping appropriation	150.00
Interest fund	193.03	Contingent principal fund	1,800.00
		Diplomas	10.45
		Permanent End. fund	70,362.87
		Donations	308.40
		Seed appropriation	141.67
		Farm House painting appropriation .....	.77
		Horticultural laboratory	63.48
Total	\$ 77,646.12	Total	\$ 77,646.12

Respectfully submitted,

J. L. GEDDES,
Deputy Treasurer.

REPORT OF THE SECRETARY OF THE BOARD OF TRUSTEES.

[FOR THE FISCAL YEAR ENDING NOVEMBER 13, 1878.]

IOWA AGRICULTURAL COLLEGE, }
Dec. 3, 1878. }

To the Honorable Board of Trustees:

In the statute prescribing the duties of the Secretary of the Board of Trustees it is specified that "he shall keep an account with the Treasurer of the College, charging him with all moneys paid to him from whatever source and crediting him with the amounts paid out by him upon the order of the Board of Audit." As directed by this law, I have, during the past year, opened and kept an account with the Treasurer, Wm. D. Lucas. At the beginning of the fiscal year, Nov. 15, 1877, there was in his hands a balance from the previous year of \$184.65. During the year I have charged him with cash received from various sources as follows: From Agent Bassett, rental on Endowment Fund land, \$29,992.48; from Agent Bassett, proceeds of sales of Contingent Fund land, \$1,440; from Agent Bassett, rental on Contingent Fund land, \$2,669.84; from the State Treasurer, interest on Endowment Fund loaned by him, \$5,417.74; from the payment of notes given for stock, etc., purchased of the College, \$1,795.49; from interest paid on these notes, \$120.30; from the sale of land donated to the College, \$200; from School Book Department, amount paid on old debt due Interest Fund, \$40.25; from diplomas, sold graduating class, \$105; from Prof. J. L. Budd, amount borrowed to construct the new sewer, \$1,472.25; from J. L. Budd, amount borrowed to build the Horticultural Laboratory, \$2,500; from the farm, horticultural, boarding and other departments of the College, and from all other sources not hitherto mentioned, except from the sale of Endowment Fund land, the sum of \$20,211.93, making, with the balance on hand at the beginning of the year, a total charge against the Treasurer of \$66,149.93. I have credited him with cash paid out upon bills approved by the Board of Audit to the amount of \$60,346.17, leaving as the cash balance in his hands at the close of the fiscal year, Nov. 13, 1878, the sum of \$5,803.76.

In addition to the sums mentioned above, the Treasurer of the College has received from Agent Bassett the sum of \$1,580, the same

being the proceeds of Endowment Fund land sold by the agent during the year. This amount he has forwarded to the State Treasurer as required by law. Added to the \$68,782.87 forwarded in previous years, it makes the total Endowment Fund now in the hands of the State Treasurer \$70,362.87. The present condition of this fund I have no means of knowing. On page 283 of the Seventh Biennial Report will be found its condition at the close of the fiscal year ending Nov. 14, 1877. Since then the State Treasurer has received from the Treasurer of the College the \$1,580 mentioned above; he has also collected a portion of the amount invested at the beginning of the year—just how much I do not know. I am therefore unable to tell the amount now invested or the amount awaiting investment. Concerning all other financial transactions connected with the management of the College funds I am able to give the Board full and complete information, for detailed statements are filed each month in my office. The Treasurer of State is not required by law to make any report to the Board of Trustees. It would be well if arrangements could be made by which he should report to me each month, or at least annually to the Board, at the end of the fiscal year.

In addition to keeping an account with the Treasurer of the College, I have, in connection with the President, examined all bills presented for payment, auditing such as were just and proper claims against the institution and for the payment of which the requisite appropriations had been made.

As a member of the Board of Audit I have, as required by Sec. 1613 of the Code of 1873, made a thorough examination of the books of the College Treasurer. In the course of this examination I have compared the duplicate receipts filed in my office with the stub of the Treasurer's receipt book. I have carefully reviewed the posting from the receipt book to the cash book. I have examined each original entry in the day book, comparing it with the corresponding receipt or voucher. I have taken note of the character of each voucher and looked to see whether it was properly audited and receipted. I have added both debit and credit sides of the cash account. I have closely inspected the work reports, the personal accounts of officers and employees and the accounts of the different departments. I have tested in various ways the accuracy of the books and accounts of the Treasurer. The errors discovered have been corrected, and I am now

prepared to certify that the Treasurer has debited himself with all cash received; that he has proper vouchers for all moneys which he claims to have paid out; and that the accounts for the fiscal year ending Nov. 13, 1878, as kept by the Deputy Treasurer, are correct.

Respectfully submitted,

E. W. STANTON,
Secretary Board of Trustees.

REPORT OF THE TREASURER.

(FOR THE YEAR ENDING NOV. 12, 1879.)

The following are the Receipts and Expenditures on account of the different College Funds for the Year ending November 12, 1879.

PERMANENT ENDOWMENT FUND.

RECEIPTS.		Dr.	Cr.
Balance from last year.....			\$70,362.87
Amount from sales of College lands			1,380.00
EXPENDITURES.			
Total amount paid State Treasurer for investment		\$71,742.87	
		71,742.87—	71,742.87

CONTINGENT PRINCIPAL FUND.

RECEIPTS.			
Balance from last year.....			1,800.00
Amount from G. W. Bassett, College land agent.....			720.00
EXPENDITURES.			
Amount invested by G. W. Bassett in mortgages.....		1,800.00	
Amount expended.....		1,800.00	
Amount unexpended		720.00	
		2,520.00—	2,520.00

CONTINGENT FUND.

RECEIPTS.			
Balance from last year			3,651.90
Amount from leases of Sioux City lands.....			2,295.67
Amount from interest on notes			172.16
Total receipts			6,119.73
EXPENDITURES.			
Paid J. L. Geddes' expenses to Chicago		25.40	
Paid J. L. Budd interest on loan.....		219.53	
Paid A. S. Welch's expenses.....		35.00	
Paid G. W. Bassett's salary to November, 1878		37.50	
Amount expended		317.43	
Amount unexpended		5,802.30	
		6,119.73—	6,119.73

INTEREST FUND.

RECEIPTS.			
Amount from G. W. Bassett, College Agent.....			31,695.76
Amount from State Treasurer, interest on investments			6,140.77
Total receipts			37,836.53

EXPENDITURES.

Balance from last year.....	193.03	
Paid A. S. Welch for furniture.....	80.00	
Paid for Chemical Laboratory.....	198.70	
Paid for College Workshop.....	519.45	
Paid for water tank.....	200.00	
Paid for Farm Department.....	2,036.49	
Paid for Horticultural Department.....	1,041.10	
Paid for salaries.....	25,827.84	
Paid for Horticultural Laboratory furniture.....	242.99	
Paid for Botanical Laboratory furniture.....	193.85	
Paid for Entomology.....	123.77	
Paid for Domestic Economy Kitchen.....	292.33	
Paid for College statement.....	150.00	
Paid for civil engineering.....	138.00	
Paid for Farm Household.....	30.28	
Paid for <i>College Quarterly</i>	461.75	
Paid for Museum.....	45.60	
Paid for College Library.....	1,050.00	
Paid for Physical Laboratory.....	204.65	
Paid for Veterinary Department.....	190.96	
Paid for ornamental grounds.....	500.00	
Paid for fires and lights.....	1,460.76	
Paid for College Printing office.....	131.12	
Paid for Botany.....	382.57	
Paid for contingent expenses.....	1,456.69	
Paid for Military Department.....	250.00	
Amount expended.....	37,401.93	
Amount unexpended.....	434.60	
	<u>37,836.53</u>	<u>37,836.53</u>

ROOM RENT.

RECEIPTS.

Received from room rent both terms.....	894.03	
Credit balance from laundry account.....	11.436	
Credit balance incidental account.....	209.2	
Total credit.....	<u>1,114.72</u>	

DISBURSEMENTS.

For repairs to College building for the purpose of keeping it in good condition for occupancy by students.....	433.08	
For repairing and purchasing furniture used by students in College building.....	472.54	
Paid for excess of expenditure over receipts in running the bath rooms.....	41.31	
	946.93	
Balance on hand available to purchase much needed furniture.....	167.79	
	<u>1,114.72</u>	<u>1,114.72</u>

BOARDING DEPARTMENT.

RECEIPTS.

Balance from last year.....	960.71	
Amount from students and others for board.....	15,444.02	
Total receipts.....	<u>16,404.73</u>	

EXPENDITURES.

Paid on account of supplies, labor and furnishing.....	15,576.48	
Amount from increase of inventory.....	30.12	
Amount expended.....	15,606.60	
Amount unexpended.....	798.13	
	<u>16,404.73</u>	<u>16,404.73</u>

DONATIONS.

RECEIPTS.

Balance from last year.....	308.40	
Received fifty-nine days interest on State warrants.....	38.53	
Total receipts.....	<u>346.93</u>	

EXPENDITURES.

Paid E. W. Stanton's expenses.....	6.70	
Paid J. Basket for building coal house.....	15.00	
Paid C. Lamb & Son for lumber.....	36.05	
Paid G. W. Bassett for binding books.....	9.30	
Paid G. Lindsay for plastering.....	15.50	
Paid Thomas & McLain's bill.....	4.75	
Paid Nichols & Maxwell's bill.....	.10	
Paid Hines & La Seur for painting.....	10.00	
Paid College Workshop.....	6.89	
Paid Bingham & Co's bill.....	1.00	
Paid W. G. Wright's bill.....	8.45	
Paid J. L. Budd interest on loan.....	38.53	
Paid Bingham & Co's bill.....	.25	
Paid C. Lamb & Son's lumber bill.....	2.00	
Paid Hines & La Seur for work.....	5.00	
Paid Cameron for brick.....	6.91	
Amount expended.....	166.43	
Amount unexpended.....	180.50	
	<u>346.93</u>	<u>346.93</u>

SCHOOL BOOKS.

Dr., balance from last year.....	185.16	
Amount received from school book department.....	98.55	
Balance due from school book department.....	86.61	
	<u>185.16</u>	<u>185.16</u>

BILLS RECEIVABLE.

Balance from last year.....	546.50	
Notes received during 1879.....	1,470.15	
Total notes received.....	2,016.65	
Notes paid during the year.....	320.00	
Amount of notes on hand.....	1,696.65	
	<u>2,016.65</u>	<u>2,016.65</u>

DIPLOMAS.

RECEIPTS.

Balance from last year.....	10.45	
Amount received for diplomas.....	120.00	
Total receipts.....	<u>130.45</u>	

EXPENDITURES.

Paid J. L. Geddes' expenses to Des Moines.....	4.40	
Paid for diploma material.....	33.23	
Amount expended.....	37.63	
Amount unexpended.....	92.82	
	130.45	[130.45]

STATE TREASURER.

Balance from last year—lands sold.....	70,362.87	
Amount from same source in 1879.....	1,380.00	
Total debit.....	71,742.87	

SEED APPROPRIATION.

Balance from last year.....	141.67	
Amount unexpended.....	141.67	
	141.67	141.67

FURNACE PIPING APPROPRIATION.

Balance from last year.....	150.00	
Amount unexpended.....	150.00	
	150.00	150.00

FARM-HOUSE PAINTING APPROPRIATION.

Balance from last year.....	.77	
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EXPENDITURE.

Paid O. P. Stuckslager for work.....	.77	
	.77	.77

CREAMERY BUILDING.

Amount received from woodland—sale of lumber.....	246.26	
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EXPENDITURES.

Paid for work and material on Creamery building.....	358.81	
Amount expended.....	358.81	
Balance, amount of expenditure over receipts.....	112.53	
	358.81	358.81

BOILER FUND.

Amount received from sale of boiler.....	100.00	
Amount expended repairing Secretary's house.....	100.00	

NEW SEWER APPROPRIATION.

RECEIPTS.

Balance from last year.....	46.47	
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EXPENDITURES.

Paid F. E. L. Beal's expenses.....	2.50	
Paid J. L. Budd cash advanced.....	38.50	
Paid J. Sexton for work.....	5.47	
Total expended, as per vouchers filed with State Auditor.....	46.47	46.47

HORTICULTURAL LABORATORY APPROPRIATION.

RECEIPTS.

Balance from last year.....	\$ 63.48
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EXPENDITURES.

Paid W. S. Lindsay for work.....	\$ 36.93
Paid C. Lamb & Sons' bill of lumber.....	2.60
Paid Bingham & Barrell's bill.....	2.88
Paid C. Lamb & Sons for lumber.....	6.25
Paid J. Basket for work.....	9.00
Paid Basket's bill.....	5.82
Amount expended, as per vouchers filed with Auditor of State.....	63.48
	63.48

PERSONAL ACCOUNTS.

Amount due from sundry persons.....	826.63
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CASH.

RECEIPTS.

Balance from last year.....	5,803.76
Amount received from all sources.....	67,383.88
Total receipts.....	73,187.64

EXPENDITURES.

Amount paid out, as per vouchers in Treasurer's office.....	67,422.25
Balance, cash on hand.....	5,765.39
	73,187.64
	73,187.64

Cash on hand belongs to the following accounts, viz.:

Boarding Department.....	\$798.13
Contingent Principal Fund.....	720.00
	\$1,518.13

The above is available for the accounts mentioned only.

The balance, \$4,247.26, is available for any purpose the Board may desire.

SUMMARY.

	DR.		CR.
School books.....	\$ 86.61	Boarding Department.....	\$ 798.13
State Treasurer.....	71,742.87	Contingent Principal Fund.....	2,520.00
Mortgage receivable.....	1,800.00	Contingent Fund.....	5,802.30
Bills receivable.....	1,696.65	Diplomas.....	92.82
Creamery building.....	112.53	Permanent Endowment Fund.....	71,742.87
Cash on hand.....	5,765.39	Donations.....	180.50
Personal accounts.....	826.63	Room rent.....	167.79
		Seed appropriation.....	141.67
		Furnace piping appropriation.....	150.00
		Interest Fund.....	434.60
	\$82,030.68		\$82,030.68

Respectfully submitted,

J. L. GEDDES,
Deputy Treasurer.

REPORT OF THE SECRETARY OF THE BOARD OF TRUSTEES.

[FOR THE YEAR ENDING NOVEMBER 12, 1879.]

IOWA AGRICULTURAL COLLEGE, }
Nov. 28, 1879. }

To the Honorable Board of Trustees:

As provided by the statute, I hereby submit my report of the proceedings of the Board of Audit, together with a statement of the account kept by me with the Treasurer of the College.

It is one of the duties of the Board of Audit to examine all bills presented for payment, and if they are in themselves correct bills against the College, properly payable from its funds, and in accordance with, and not in excess of, the appropriations made by the Board of Trustees, to order them paid by the Treasurer. In the discharge of this duty the Board of Audit have examined all bills paid during the year. Before auditing any bill they require that the correctness of each item of the bill shall be certified to by the head of the department making the purchase. No item not thus signed is allowed. The character of the bill is also noted by the Board of Audit. Under this system it is hardly possible for any false or erroneous claim to pass the Board without detection. It is however, quite difficult to comply strictly with requirement, not to audit bills against a department in excess of the amount appropriated to that department. In every case the appropriation to a department is made up not only of a definite sum set apart from Interest Fund, but also includes all the ordinary sales of the department. This last factor is an indefinite one. The Board of Audit are often compelled to estimate it and audit bills upon the strength of sales not made, but which the department can reasonably expect to make before the close of the fiscal year.

It is the endeavor of the Board of Audit always to leave a sufficient margin so that the appropriation of the Board of Trustees will in no case be finally exceeded. Sometimes, however, the amount realized from sales falls below the estimate and the account shows at the end of the year a total expenditure in excess of the appropriation made by the Board of Trustees. In the accounts of the past year, the expenditures exceed the appropriation only in a single instance. At the May meet-

ing the Board appropriated from the proceeds of Farm Woodlands a certain sum for the erection of a creamery. They also authorized the use of a portion of the lumber belonging to that account in repairing the College barn. The remainder of the lumber, together with the wood belonging to the account, was disposed of for \$813.39. The expense of cutting and hauling wood, and cutting, hauling and sawing lumber, amounted to \$567.11; leaving a balance, \$246.28, available for paying bills incurred in building the creamery. This balance was so applied. The expense of building the creamery was \$358.81. The bills against it were all paid under the supposition that the balance in Farm Woodland account, would be sufficient to cover them. The balance being only \$246.28, and the bills amounting to \$358.81, the account shows an overdraft of \$112.53.

It is also required of the Board of Audit that they make a monthly examination of the books and vouchers of the Treasurer. In accordance with this requirement, I have made a thorough examination of the Treasurer's accounts. I have examined each voucher to see that it was properly audited and correctly entered in the day-book. I have compared the receipt book with the cash book, and added the debit and credit sides of the cash account. I have also taken note that the different accounts were closed into their proper funds. By comparison of balances, and by the various means resorted to in book-keeping, I have tested the correctness of the Treasurer's books.

I have also kept an account with the Treasurer, debiting him with all cash received from whatever source, and crediting him with all sums paid out on the order of the Board of Audit. At the beginning of the year, there was in the hands of the Treasurer, the sum of \$5,803.76. During the year I have debited him with amounts received from various sources, as follows: From Agent Bassett, proceeds of the sales of Endowment Fund land, \$1,380; from State Treasurer, appropriation for building Horticultural Laboratory, \$2,500; from State Treasurer, appropriation for building new sewer, \$1,472.25; from State Treasurer, interest on warrants, \$38.53; from Agent Bassett, rental on Endowment Fund land, \$31,695.76; from Agent Bassett, proceeds of sales of Contingent Fund land, \$720; from Agent Bassett, rental on Contingent Fund lands, \$2,295.67; from the State Treasurer, interest on the Endowment Fund invested by him, \$6,140.72; from the payment of notes given for stock, etc., purchased of the College, \$320; from interest paid on these notes, \$26.23; from school-book department, amount paid on old debt due Interest Fund, \$98.55; from diplomas sold grad-

uating class, \$120; from the farm, horticultural, boarding and other departments of the College, and from all other sources not hitherto mentioned, the sum of \$20,576.17, making with the balance on hand at the commencement of the fiscal year, a total charge against the Treasurer of \$73,187.64. I have credited the Treasurer with bills paid by him on the order of the Board of Audit to the amount of \$67,422.25, leaving as the cash balance in his hands at the close of the fiscal year, the sum of \$5,765.39. Of this amount, \$720 is to the credit of the Contingent Principal Fund, and \$798.13 to the credit of the boarding department, leaving \$4,247.26 to the credit of the College funds, subject to appropriation by the Board.

As a result of my examinations, I am able to certify that all errors in the Treasurer's books have been corrected, and that as they now stand they are correct.

Respectfully submitted,

E. W. STANTON,
Secretary Board of Trustees.

REPORT OF LAND AGENT BASSETT.

To the Board of Trustees of the Iowa State Agricultural College:

The following report of the Land Department of the College from October 31, 1877, to October 31, 1879, is hereby submitted for your consideration.

GEORGE W. BASSETT, *Agent.*

INTEREST FUND.

Interest collected month of November, 1877.....	\$ 3,535.11
Interest collected month of December, 1877.....	3,242.59
Interest collected month of January, 1878.....	3,185.52
Interest collected month of February, 1878.....	956.13
Interest collected month of March, 1878.....	1,930.95
Interest collected month of April, 1878.....	1,523.09
Interest collected month of May, 1878.....	2,943.77
Interest collected month of June, 1878.....	3,551.72
Interest collected month of July, 1878.....	3,178.17
Interest collected month of August, 1878.....	2,234.45
Interest collected month of September, 1878.....	2,118.97
Interest collected month of October, 1878.....	2,624.06
Total.....	\$ 31,024.53
Amount remitted November 22, voucher number 91.....	\$ 1,000.00
Amount remitted November 30, voucher number 92.....	2,530.61
Exchange on October remittance.....	3.50
Amount remitted December 31, voucher number 93.....	3,239.59
Exchange on November remittances.....	3.00
Amount remitted January 31, voucher number 94.....	3,182.92
Exchange on December remittances.....	2.60
Amount remitted February 28, voucher number 95.....	953.38
Exchange on January remittances.....	2.75
Amount remitted March 31, voucher number 96.....	1,930.05
Exchange on February remittances.....	.90
Amount remitted April 30, voucher number 97.....	1,519.79
Exchange on March remittances.....	3.30
Amount remitted May 31, voucher number 98.....	2,941.77
Exchange on April remittances.....	2.00
Amount remitted June 30, voucher number 99.....	3,548.97
Exchange on May remittances.....	2.75
Amount remitted July 31, voucher number 100.....	3,174.92
Exchange on June remittances.....	3.25
Amount remitted August 31, voucher number 101.....	2,231.45
Exchange on July remittances.....	3.00
Amount remitted September 30, voucher number 102.....	2,116.97
Exchange on August remittances.....	2.00
Amount remitted October 31, 1878, voucher number 103.....	2,622.06
Exchange on September remittances.....	2.00
	\$31,023.53
By error in October, 1877.....	1.00
Total.....	\$ 31,024.53

Interest collected month of November, 1878	\$ 4,275.54
Interest collected month of December, 1878	3,345.95
Interest collected month of January, 1879	4,102.85
Interest collected month of February, 1879	1,178.05
Interest collected month of March, 1879	1,731.57
Interest collected month of April, 1879	1,581.37
Interest collected month of May, 1879	1,624.15
Interest collected month of June, 1879	2,678.64
Interest collected month of July, 1879	2,774.08
Interest collected month of August, 1879	3,187.40
Interest collected month of September, 1879	1,824.00
Interest collected month of October, 1879	3,355.71

Total 31,722.31

Amount remitted November 30, voucher number 104	\$ 4,273.54
Exchange on October remittances	2.00
Amount remitted December 31, voucher number 105	3,343.95
Exchange on November remittances	2.00
Amount remitted January 31, voucher number 106	4,100.35
Exchange on December remittances	2.50
Amount remitted February 28, voucher number 107	1,174.55
Exchange on January remittances	3.50
Amount remitted March 31, voucher number 108	1,730.32
Exchange on February remittances	1.25
Amount remitted April 30, voucher number 109	1,583.37
Exchange on March remittances	1.00
Amount remitted May 31, voucher number 110	1,681.20
Exchange on April remittances	2.95
Amount remitted June 30, voucher number 111	2,677.04
Exchange on May remittances	1.60
Amount remitted July 31, voucher number 112	2,771.33
Exchange on June remittances	2.75
Amount remitted August 31, voucher number 113	3,184.90
Exchange on July remittances	2.50
Amount remitted September 30, voucher number 114	1,821.00
Exchange on August remittances	3.00
Amount remitted October 31, voucher number 115	3,354.21
Exchange on September remittances	1.50

Total 31,722.31

CONTINGENT INTEREST.

Amount collected during month of November, 1877	\$ 119.67
Amount collected during month of December, 1877	227.20
Amount collected during month of January, 1878	134.40
Amount collected during month of February, 1878	153.60
Amount collected during month of March, 1878	527.20
Amount collected during month of April, 1878	128.00
Amount collected during month of May, 1878	134.40
Amount collected during month of June, 1878	316.80
Amount collected during month of July, 1878	140.80
Amount collected during month of August, 1878	380.80
Amount collected during month of September, 1878	288.00
Amount collected during month of October, 1878	118.97

2,669.84

Amount remitted November 30, 1878, voucher number 14	\$ 119.67
Amount remitted December 31, 1879, voucher number 15	227.29
Amount remitted January 31, 1878, voucher number 16	134.40
Amount remitted February 28, 1878, voucher number 17	153.60
Amount remitted March 31, 1878, voucher number 18	527.20
Amount remitted April 30, 1878, voucher number 19	128.00
Amount remitted May 31, 1878, voucher number 20	134.40
Amount remitted June 30, 1878, voucher number 21	316.80
Amount remitted July 31, 1878, voucher number 22	140.80
Amount remitted August 31, 1878, voucher number 23	380.80
Amount remitted September 30, 1878, voucher number 24	288.00
Amount remitted October 31, 1878, voucher number 25	118.97

2,669.84

Amount collected during month of January, 1879	25.60
Amount collected during month of February, 1879	310.40
Amount collected during month of March, 1879	368.00
Amount collected during month of April, 1879	371.20
Amount collected during month of May, 1879	96.00
Amount collected during month of June, 1879	166.40
Amount collected during month of July, 1879	156.80
Amount collected during month of August, 1879	460.80
Amount collected during month of September, 1879	276.47
Amount collected during month of October, 1879	64.00

2,295.67

Amount remitted Jan. 31, 1879, voucher number 26	25.60
Amount remitted February 28, 1879, voucher number 27	310.40
Amount remitted March 31, 1879, voucher number 28	368.00
Amount remitted April 30, 1879, voucher number 29	371.20
Amount remitted May 31, 1879, voucher number 30	96.00
Amount remitted June 30, 1879, voucher number 31	166.40
Amount remitted July 31, 1879, voucher number 32	156.80
Amount remitted August 31, 1879, voucher number 33	460.80
Amount remitted September 30, 1879, voucher number 34	276.47
Amount remitted October 31, 1879, voucher number 35	64.00

2,295.67

ENDOWMENT FUND.

Collected during month of April, 1878	\$ 392.00
Collected during month of May, 1878	360.00
Collected during month of June, 1878	360.00
Collected during month of July, 1878	468.00
Collected during month of January, 1879	180.00
Collected during month of April, 1879	1,200.00

2,960.00

Remitted to Treasurer April 30, 1878, voucher number 40	392.00
Remitted to Treasurer May 30, 1878, voucher number 41	360.00
Remitted to Treasurer June 30, 1878, voucher number 42	360.00
Remitted to Treasurer July 31, 1878, vouchers numbers 43 and 44	468.00
Remitted to Treasurer January 31, 1879, voucher number 45	180.00
Remitted to Treasurer April 30, 1879, voucher number 46	1,200.00

2,960.00

CONTINGENT FUND PRINCIPAL.

Collected during months of January and March, 1878	\$ 1,440.00
Collected during month of May, 1879	320.00
Collected during month of June, 1879	400.00
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	2,160.00
Remitted to Treasurer April 31, 1878, voucher number 1	1,440.00
Remitted to Treasurer May 31, 1878, voucher number 2	320.00
Remitted to Treasurer June 30, 1879, voucher number 3	400.00
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	2,160.00

I have loaned of the foregoing fund, in conformity with the instructions of the Board of Trustees, the sum of..... 1,800.00

The above loaned for terms of three and five years, at nine per cent annual interest, amply secured, upon improved farming land.

SUMMARY.

Interest Fund collected November 1, 1877, to October 31, 1878	\$31,024.53
Interest Fund collected November 1, 1878, to October 31, 1879	31,722.31
Contingent interest collected November 1, 1877, to October 31, 1878.....	2,669.84
Contingent interest collected November 1, 1878, to October 31, 1879.....	2,295.67
Endowment Fund collected November 1, 1877, to October 31, 1879	2,960.00
Contingent Fund Principal collected November 1, 1877, to October 31, 1879.....	2,160.00
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	72,832.35

Exchange upon the above sum is charged to the Interest Fund, as shown in the foregoing statement.

Respectfully submitted,

GEO. W. BASSETT, *Agent.*

LIST OF IOWA AGRICULTURAL COLLEGE LANDS LEASED FROM NOVEMBER 1, 1877, TO NOVEMBER 1, 1879.

No. of lease.	PART OF SECTION.	Section.	Township.	Range.	Acres.	Price.	Total value.	NAME OF LESSEE.	DATE.	1877.	First payment of interest.	Office fee.
1710	se qr	6	98	27	160	\$ 3.50	\$560.00	Mary Clark	Nov. 15	\$44.80	\$14.00	
1711	sw qr	1	99	28	160	3.50	560.00	Hattie Greene	Nov. 15	44.80	14.00	
1712	se qr	2	99	28	160	3.50	560.00	Jacob Leavieid	Nov. 15	44.80	14.00	
1713	ne qr	11	99	28	160	3.50	560.00	William Greene	Nov. 15	44.80	14.00	
1714	nw qr	12	99	28	160	3.50	560.00	W. L. Greene	Nov. 15	44.80	14.00	
1715	se qr	11	98	27	160	3.00	480.00	H. Meeker	Nov. 16	38.40	14.00	
1716	sw qr	11	98	27	160	3.00	480.00	J. T. Huffman	Nov. 16	38.40	14.00	
1717	se qr	10	98	27	160	2.50	400.00	R. B. Page	Nov. 16	32.00	14.00	
1718	sw qr	10	98	27	160	3.50	560.00	J. J. Burke	Nov. 16	44.80	14.00	
1719	sw qr	34	98	30	160	3.50	560.00	John Marshall	Nov. 15	44.80	14.00	
1720	se qr	28	99	33	148.33	5.00	741.65	T. C. Stewart	Nov. 21	59.33	14.00	
1721	se qr	36	100	34	160	4.00	640.00	A. M. Delano	Nov. 23	51.20	14.00	
1722	sw qr	36	100	34	160	4.00	640.00	F. M. Delano	Nov. 23	51.20	14.00	
1723	ne qr	32	94	32	160	3.00	480.00	J. B. Kimball	Nov. 28	38.40	14.00	
1724	nw qr	32	94	32	160	3.00	480.00	W. W. Sweet	Nov. 28	38.40	14.00	
1725	se qr	32	94	32	160	3.00	480.00	Fannie C. McClare	Nov. 28	38.40	14.00	
1726	sw qr	32	94	32	160	3.00	480.00	Samuel Knodle	Nov. 28	38.40	14.00	
1727	sw qr	2	98	27	160	3.00	480.00	K. O. Belland	Dec. 1	38.40	14.00	
1728	sw qr	3	98	27	160	3.00	480.00	Wm. G. Hollahan	Dec. 1	38.40	14.00	
1729	se qr	8	98	27	160	3.50	560.00	G. W. Smith	Dec. 1	44.80	14.00	
1730	ne qr	9	98	27	160	3.00	480.00	N. Fleek	Dec. 1	38.40	14.00	
1731	nw qr	9	98	27	160	3.00	480.00	G. W. Patterson	Dec. 1	38.40	14.00	
1732	sw qr	12	98	27	160	3.50	560.00	J. B. Williams	Dec. 1	44.80	14.00	
1733	ne qr	17	99	31	160	4.00	640.00	F. Beckardt	Dec. 1	51.20	14.00	
1734	nw qr	17	99	31	160	4.00	640.00	Nael Stevenson	Dec. 1	51.20	14.00	
1735	se qr	17	99	31	160	4.00	640.00	J. E. Murkle	Dec. 1	51.20	14.00	
1736	sw qr	17	99	31	160	4.00	640.00	M. Flynn	Dec. 1	51.20	14.00	
1737	nw qr	35	92	49	160	4.00	640.00	Edward Doyle	Dec. 6	51.20	14.00	
1738	ne qr	22	94	39	160	3.50	560.00	S. B. Prindle	Dec. 21	44.80	14.00	
1739	sw qr	28	90	32	160	5.00	800.00	Nuton Schmukosky	Dec. 21	64.00	14.00	
1740	se qr	22	94	39	160	3.50	560.00	S. B. Prindle	Dec. 26	44.80	14.00	
1741	sw qr	2	99	28	160	3.50	560.00	C. S. Blanchard	Dec. 29	44.80	14.00	
1878.												
1742	n hf of nw qr	28	88	41	80	3.00	240.00	Wm. P. Evans	Jan. 8	19.20	14.00	
1743	sw qr	22	97	30	160	2.55	408.00	Richardson & Gregory	Jan. 25	32.64	14.00	
1744	se qr	22	93	31	160	5.00	800.00	E. H. Middekauff	Feb. 13	64.00	14.00	
1745	ne qr	23	97	30	160	4.00	640.00	J. B. Jones	Feb. 26	51.20	14.00	
1746	ne qr	11	96	30	160	5.00	800.00	Fredk. Pompe	March 21	64.00	14.00	
1747	ne qr	32	97	30	160	3.50	560.00	J. E. Stacy	March 21	44.80	14.00	
1748	nw qr	23	97	30	160	4.00	640.00	J. Q. A. Hadson	March 21	51.20	14.00	
1749	nw qr	22	99	33	160	4.00	640.00	W. R. Willett	March 25	51.20	14.00	
1750	ne qr	22	99	33	160	4.00	640.00	James Willett	March 25	51.20	14.00	
1751	se qr	22	99	33	160	4.00	640.00	P. J. Willett	March 25	51.20	14.00	
1752	sw qr	22	99	33	160	4.00	640.00	Lucinia M. Call	March 25	51.20	14.00	
1753	sw qr	28	99	33	160	4.00	640.00	Wm. S. Walker	March 25	51.20	14.00	
1754	sw qr	26	93	33	160	4.00	640.00	S. P. Walker	March 25	51.20	14.00	
1755	sw qr	28	97	33	160	5.00	800.00	W. J. Brown	March 28	64.00	14.00	
1756	sw qr	32	90	23	160	5.00	800.00	F. R. Sheldon	April 4	64.00	14.00	
1757	ne qr	32	96	31	160	4.00	640.00	Dexter H. Hutchinson	April 4	51.20	14.00	
1758	se qr	32	93	31	160	4.00	640.00	Helen M. Hutchinson	April 9	51.20	14.00	
1759	nw qr	32	88	41	160	4.00	640.00	C. P. Fredendoll	April 10	51.20	14.00	
1760	ne qr	28	99	33	160	4.00	640.00	Chris Reed	April 19	51.20	14.00	
1761	sw qr	13	100	36	160	4.00	640.00	Carl E. Blackert	April 19	51.20	14.00	
1762	nw qr	11	99	28	160	3.50	560.00	Mary Clark	May 1	44.80	14.00	
1763	nw qr	26	90	24	160	5.00	800.00	Daniel Loshier	May 2	64.00	14.00	
1764	se qr	26	90	24	160	5.00	800.00	George Bryer	May 2	64.00	14.00	
1765	sw qr	26	90	24	160	5.00	800.00	Joseph Rush	May 2	64.00	14.00	
1766	ne qr	22	96	31	160	5.00	800.00	Mary A. Scriber	May 2	64.00	14.00	
1767	se qr	27	97	27	160	4.00	640.00	J. B. Jones	May 2	51.20	14.00	

LIST OF COLLEGE LANDS - CONTINUED.

No. of lease.	PART OF SECTION.	Section.	Township.	Range.	Acres.	Price.	Total value.	NAME OF LESSEE.	DATE.	First payment of interest.	Office fee.
1878.											
1768	nw qr	35	97	27	160	\$4.00	\$640.00	A. L. Hudson	May 2	\$51.20	\$14.00
1769	ne qr	34	97	27	160	4.00	640.00	W. J. Wyman	May 2	51.20	14.00
1770	sw qr	14	86	42	160	5.00	800.00	Engelene Towner	May 2	64.00	14.00
1771	n hf se qr	32	87	45	80	4.00	320.00	John M. Wightman	May 11	25.00	14.00
1772	se qr	22	98	29	160	5.00	800.00	L. D. Thour	May 13	64.00	14.00
1773	nw qr	28	93	36	160	4.00	640.00	L. J. Lundemore	June 10	51.20	14.00
1774	w hf of e qr	34	94	37	80	4.00	320.00	W. J. Evans	June 10	25.00	14.00
1775	e hf of sw qr	36	87	41	80	4.00	320.00	M. J. Cox	June 10	25.00	14.00
1776	se qr	22	98	33	160	4.00	640.00	Hans Harrison	June 10	51.20	14.00
1777	nw qr	30	95	33	161.29	3.50	564.51	M. L. Brown	June 10	45.16	14.00
1778	sw qr	27	95	27	160	3.50	560.00	Philip Dietrick	June 11	44.80	14.00
1779	se qr	31	95	33	160	4.00	640.00	Henry Sanders	June 18	51.20	14.00
1780	ne qr	2	98	34	157.77	3.50	552.20	Levat Levatson	June 22	44.18	14.00
1781	ne qr	12	96	32	160	5.00	800.00	A. M. Bryson	June 26	64.00	14.00
1782	nw qr	12	96	32	160	5.00	800.00	O. S. Gossard	June 26	64.00	14.00
1783	ne qr of ne qr	12	92	40	40	3.75	150.00	H. C. Blackmer	July 9	12.00	14.00
1784	e hf of nw qr	4	93	27	97.09	4.00	388.36	James Myer	July 11	31.06	14.00
1785	sw qr	34	99	34	160	3.00	480.00	Ole Tallefson	July 26	38.40	14.00
1786	s hf of ne qr	18	87	40	80	4.00	320.00	Joseph Ferguson	Aug. 12	25.00	14.00
1787	s hf of se qr	22	90	47	80	5.25	420.00	Francis Harvey	July 7	33.60	14.00
1788	n hf of nw qr	2	87	41	78.77	4.00	307.08	Joseph A Reed	Sept. 5	24.57	14.00
1789	w hf se qr	23	97	27	80	3.50	280.00	L. B. Clark	Sept. 5	22.40	14.00
1790	se qr	34	99	34	160	3.00	480.00	Ole Tallefson	Sept. 5	38.40	14.00
1791	w hf se qr	31	94	37	80	5.00	400.00	Wm. M. Roberts	Sept. 20	32.00	14.00
1792	ne qr	24	98	34	160	3.00	480.00	Erich Ellingson Alberg	Sept. 20	38.40	14.00
1793	se qr	28	96	36	160	4.00	640.00	George McGregor	Oct. 12	51.20	14.00
1794	sw qr of nw qr	4	93	27	40	4.00	160.00	Joseph Myers (leases '78 and '79)	Oct. 21	12.80	14.00
1795	s hf of sw qr and s hf of se qr	9	94	36	160	4.00	640.00	H. D. Evans	Nov. 7	51.20	14.00
1796	w hf of ne qr and s hf of ne qr	9	94	36	160	4.00	640.00	Susan K. Evans	Nov. 7	51.20	14.00
1797	ne qr	4	93	36	175.65	4.00	702.60	Wm. H. Parker	Nov. 7	56.20	14.00
1798	sw qr	23	94	28	160	4.50	720.00	Etta Parker	Nov. 7	57.60	14.00
1799	sw qr	27	99	31	160	3.50	560.00	Richard T. Jones	Nov. 7	44.80	14.00
1800	w hf of nw qr	10	86	42	80	5.00	400.00	Patrick Murphy	Nov. 18	32.00	14.00
1879.											
1801	se qr	2	94	28	160	4.00	640.00	Andrew Campbell	Jan. 2	51.20	14.00
1802	sw qr	2	94	28	160	4.00	640.00	Susan E Campbell	Jan. 2	51.20	14.00
1803	sw qr of sw qr	32	86	44	40	3.00	120.00	W. R. Irish	March 18	9.60	14.00
1804	e hf of ne qr	32	87	40	80	3.75	300.00	Solomon Nicolls	April 28	24.00	14.00
1805	w hf of sw qr	10	86	42	80	5.00	400.00	John Quigley	April 28	32.00	14.00
1806	s hf of sw qr	18	97	32	79.25	4.00	317.00	M. L. Brown	May 22	25.36	14.00
1807	e hf of se qr	4	93	36	80	3.75	300.00	James Miller	Aug. 8	24.00	14.00
1808	sw qr	10	93	36	160	4.00	640.00	Julia Ann Hemminger	Sept. 25	51.20	14.00

ABSTRACT OF LEASES OF LANDS IN "SIOUX CITY PURCHASE."

No. of lease.	PART OF SECTION.	Section.	Township.	Range.	Acres.	Price.	Total value.	NAME OF LESSEE.	DATE.	First payment of interest.	Office fee.
1877.											
94	ne qr	12	90	41	160	\$10.75	\$1,720.00	A. J. Clark	Dec. 26	\$137.60	\$14.00
95	se qr	12	90	41	160	5.00	800.00	A. J. Clark	Dec. 26	64.00	14.00
1878.											
96	ne qr	19	100	48	160	3.50	560.00	Wells Dickinson	May 2	44.80	14.00
97	ne qr	20	100	48	160	3.50	560.00	J. S. Knowles	June 10	44.80	14.00
98	ne qr	34	90	41	160	5.00	800.00	F. R. Fulton	July 9	64.00	14.00
99	sw qr	29	98	47	160	5.00	800.00	Oley Hulverson	Sept. 20	64.00	14.00
100	nw qr	17	90	47	160	4.50	720.00	Oley H. Brunson	Sept. 24	57.60	14.00
101	sw qr	17	90	47	160	4.50	720.00	Oley Neilson	Sept. 24	57.60	14.00
102	ne qr	18	99	47	160	4.50	720.00	Emily O. Brunson	Sept. 24	57.60	14.00
1879.											
103	ne qr	36	90	41	160	2.25	360.00	William Murhennett	Feb. 1	28.80	14.00
104	ne qr	12	99	45	160	2.50	400.00	Solomon T. Osborne	Feb. 1	32.00	14.00
105	nw qr	12	99	45	160	2.50	400.00	Solomon T. Osborne	Feb. 1	32.00	14.00
106	se qr	12	99	45	160	2.50	400.00	Solomon T. Osborne	Feb. 1	32.00	14.00
107	sw qr	12	99	45	160	2.50	400.00	Solomon T. Osborne	Feb. 1	32.00	14.00
108	sw qr	34	90	41	160	2.75	440.00	H. L. Merriman	June 5	35.20	14.00
109	se qr	34	90	41	160	2.75	440.00	H. L. Merriman	June 5	35.20	14.00
110	sw qr	36	90	41	160	2.75	440.00	N. Cox	July 22	35.20	14.00
111	ne qr	34	93	36	160	3.00	480.00	Joseph R. Noel	Aug. 8	38.40	14.00
112	se qr	34	93	36	160	3.00	480.00	Alphonso B. Williams	Aug. 8	38.40	14.00
113	nw qr	24	93	36	160	3.00	480.00	James Gilmore	Aug. 18	38.40	14.00
114	ne qr	24	93	36	160	3.00	480.00	Eliza Gilmore	Aug. 18	38.40	14.00
115	se qr	26	93	36	160	3.00	480.00	Isaac Edwards	Aug. 30	38.40	14.00
116	nw qr	12	99	38	160	2.50	400.00	William H. Fife	Sept. 25	32.00	14.00
117	nw qr	12	99	38	160	2.50	400.00	George W. Fife	Sept. 25	32.00	14.00
118	sw qr	12	99	38	160	2.50	400.00	Charles H. Fife	Sept. 25	32.00	14.00
119	se qr	12	99	38	160	2.50	400.00	William J. Fife	Sept. 25	32.00	14.00

Total number of acres leased since last Biennial Report, October 31, 1877 18,456.15

Number of acres unleased and now in the market 26,475.50

SETTLEMENT WITH LAND AGENT BASSETT.

REPORT OF THE SECRETARY.

[SETTLEMENT EXTENDING FROM NOVEMBER 1, 1877, TO NOVEMBER 1, 1879.]

AGRICULTURAL COLLEGE, NOV. 27, 1879.

To the Honorable Board of Trustees:

GENTLEMEN:—I beg leave to submit the following report upon my settlement with land agent Bassett for the biennial period beginning November 1, 1877, and ending November 1, 1879.

It will be remembered that I have in my office a complete list of all the land owned by the College, together with the valuation fixed upon the same by the Board of Trustees. The agent is required to account for all this land as either sold, leased, or in the market for lease. (1.) In case of sale, the money received therefrom is forwarded through the College Treasurer to the State Treasurer for investment, and not only must the agent present proper vouchers for the moneys thus collected and forwarded, but the accounts of the three officers must agree. (2.) All land leased, together with the name of the lessee and date of lease, is reported to this office. A strict account is kept with each of these lessees, and the agent is required to transmit monthly to the College Treasurer all interest due and paid on the same. In case of failure to pay on the part of the lessee, the agent is required to declare said lease forfeited, and report the tract to the Board for re-appraisalment. (3.) All land not sold or leased is advertised *for lease* by the agent. Printed lists of the lands thus advertised are filed in my office. In one of the three ways thus described, the agent has accounted for all the land in his charge during the past two years.

ENDOWMENT FUND LAND.—Of the land included in the Congressional grant, and known upon the books of the College as Endowment Fund land, there was sold during the biennial period, 1,120 acres. The amount received from the sale of said land was \$2,960, which sum was promptly remitted by the Agent to the Treasurer of the College.

From the rental on leases of Endowment Fund land, the Agent received during the period covered by this report, as shown by his receipts from number 5,632 to number 6,744 inclusive, and by new sales from number 1,710 to number 1,808 inclusive, the sum of \$62,746.34. At

the beginning of the period, there was due the Agent because of an error in previous settlement, the sum of fifty cents. During the period he paid as exchange on his monthly remittances, the sum of \$57.60. The balance, \$62,746.34, he paid over to the College Treasurer, as shown by his vouchers from number 91 to number 115 inclusive.

CONTINGENT FUND LAND.—Of the land purchased with accumulated interest money, and known upon the books of the College as Contingent Fund land, there was sold during the past two years 960 acres. The amount received therefor, \$2,160, was duly forwarded to the College Treasurer.

From the lease of Contingent Fund land the agent received, as shown by his receipts from No. 69 to 146, inclusive, the sum of \$4,965.51. This amount he has forwarded to the College Treasurer, as shown by vouchers from No. 14 to No. 35, inclusive.

CONTINGENT PRINCIPAL FUND.—In 1876 there was received from the sale of Contingent Fund land the sum of \$360. During the two years ending November 1, 1879, there was received from the same source, as shown above, the sum of \$2,160, making \$2,520 as the total amount realized from the sale of Contingent Fund land since January 1, 1876. The fund thus derived is designated upon the College books as Contingent Principal Fund. By an order of the Board passed at the meeting held in July, 1878, it was directed that this fund should be loaned on farm mortgages at 9 per cent. G. W. Bassett was appointed agent for effecting said loans. Of the sum to the credit of the fund (\$2,520) he has loaned \$1,800, leaving \$720 not yet loaned. This amount the agent expects to loan during the coming month. No interest has yet been paid on the loans made.

Accompanying this report is a summary of the transactions of the land agency for the two years ending November 1, 1879, taken from the books in my office; also, a statement of the investments made by Agent Bassett of the fund arising from the sale of Contingent Fund land, and a statement of the investments by the State Treasurer of the fund arising from the sale of Endowment Fund land.

Respectfully submitted,

E. W. STANTON,
Secretary Board of Trustees.

SUMMARY.

The following is a summary of the transactions of the land agency for the two years ending November 1, 1879:

ENDOWMENT FUND LAND.

Number of acres of Congressional grant.....	204,206.36
Number of acres patented prior to November 1, 1877.....	29,842.00
Number of acres patented from November 1, 1877, to November 1, 1879.....	1,120.00
Total number of acres patented.....	30,962.00
Number of acres under lease.....	147,968.86
Number of acres in market for lease.....	25,276.50
	<u>204,206.36</u>
Amount received from sales of Endowment Fund land prior to November 1, 1877.....	\$ 68,782.87
Amount received from sales from November 1, 1877, to November 1, 1879.....	2,960.00
Total amount received from sales of Endowment Fund land and transmitted through the College Treasurer to the State Treasurer, for investment.....	71,742.87
Amount of interest on leases of Endowment Fund land collected during year ending November 1, 1878.....	31,024.03
Amount of interest collected during the year ending November 1, 1879.....	31,723.31
Total during the two years.....	\$ 62,746.34
Balance due Agent, November 1, 1877.....	\$.50
Amount paid over by Agent to College Treasurer during year ending November 1, 1878.....	30,992.48
Exchange on same.....	31.05
Amount paid to College Treasurer during year ending November 1, 1879.....	31,695.76
Exchange on same.....	26.55
Total.....	\$62,746.34

CONTINGENT FUND LAND.

Number of acres purchased with accumulated interest money in 1868.....	15,013.17
Number of acres patented prior to November 1, 1877.....	640.00
Number of acres patented from November 1, 1877, to November 1, 1879.....	960.00
Total number of acres patented.....	1,600.00
Number of acres under lease.....	12,213.17
Number of acres in market for lease.....	1,200.00
	<u>15,013.17</u>
Amount received from sales of Contingent Fund land and paid over to College Treasurer prior to November 1, 1877.....	\$ 1,440.00
Amount received from sale of land and paid over to College Treasurer from November 1, 1877, to November 1, 1879.....	2,160.00
Total received from sale of Contingent Fund land.....	\$ 3,600.00
Of this amount there was paid back to interest Fund.....	\$ 1,080.00
Set aside as Contingent Principal Fund.....	2,520.00
	<u>\$3,600.00</u>

Amount of interest on leases of Contingent Fund land collected during the year ending November 1, 1878, and paid over to College Treasurer.....	\$ 2,669.84
Amount of interest collected during year ending November 1, 1879, and paid over to the College Treasurer.....	2,295.67
Total for the two years.....	<u>\$4,965.51</u>

Of the amount to the credit of the Contingent Principal Fund, Agent Bassett has loaned \$1,800, as follows:

Loan No. 1—Mr. Carpenter—November 1, 1878, 3 years at 9 per cent.....	\$ 1,500.00
Loan No. 2—Elizabeth Cummins—March 12, 1879, 5 years at 9 per cent.....	300.00
	<u>\$ 1,800.00</u>

Of the sum of \$71,742.87 received from the sale of Endowment Fund land and forwarded to the State Treasurer, there has been invested the sum of \$65,700, leaving a cash balance in his hands on November 1, 1879, of \$6,042.87.

The investments are as follows:

Iowa State bonds, drawing 7 per cent interest.....	\$13,000.00
School bonds of the Independent School District of Greenbush, dated August 29, 1876, running ten years, at 10 per cent interest.....	300.00
Bonds of the city of Davenport, dated December 13, 1869, running twenty years, with interest at 6 per cent.....	10,000.00
School bonds of the Independent School District of Woodlawn, dated October 1, 1876, running ten years, at 10 per cent interest.....	600.00
School bonds of the Independent School District of Milford, dated August 20, 1876, running ten years, at 10 per cent interest.....	2,500.00
School bonds of the Independent School District of Lucas, dated September 1, 1876, running six years, at 10 per cent interest.....	1,500.00
Bonds of Winnebago county, dated December 1, 1878, running twenty years, with interest at 8 per cent.....	5,600.00
School bonds of the Independent School District of Maquoketa, dated April 7, 1879, running ten years, at 8 per cent interest.....	2,000.00
School bonds of the Independent School District of Des Moines (East Side), dated May 1, 1879, running ten years, at 7 per cent interest.....	1,500.00
School bonds of the Independent School District of Ankeney, dated June 2, 1879, running ten years, at 7 per cent interest.....	100.00
School bonds of the Independent School District of Chariton, dated June 2, 1879, running ten years, at 7 per cent interest.....	5,500.00
School bonds of the Independent School District of Des Moines (East Side), dated May 1, 1879, running ten years, at 7 per cent interest.....	9,000.00
School bonds of the Independent School District of Ankeney, dated June 2, 1879, running ten years, at 7 per cent interest.....	100.00
School bonds of the Independent School District of Miles, dated July 1, 1879, running ten years, at 7 per cent interest.....	4,000.00
School bonds of the Independent School Districts of Stanwood, Perry and Mt. Ayr, dated respectively August 5, May 1 and September 1, 1879, all running ten years, at 7 per cent interest; amount of each, in order, \$3,000, \$2,000, \$5,000; total.....	10,000.00
Cash on hand.....	6,042.87
Total.....	<u>\$71,742.87</u>

ABSTRACT OF THE PROCEEDINGS OF THE BOARD OF TRUSTEES.

MEMBERS OF THE BOARD.

THE HON. BUEL SHERMAN, Fredricksburgh, - - -	1880.
THE HON. G. H. WRIGHT, Sioux City, - - -	1880.
THE HON. JOHN N. DIXON, Oskaloosa, - - -	1882.
THE HON. H. G. LITTLE, Grinnell, - - -	1882.
THE HON. WILLIAM McCLINTOCK, West Union, -	1882.

PROCEEDINGS FOR 1878.

During the year the following meetings were held:

<i>First meeting</i> , - - - - -	May 21-24
<i>Second meeting</i> , - - - - -	July 23-26
<i>Third meeting</i> - - - - -	November 9-13
<i>Fourth meeting</i> , - - - - -	December 3-11

The Board organized at the May meeting with the following officers:

THE HON. JOHN N. DIXON, Oskaloosa, - - -	CHAIRMAN.
E. W. STANTON, Ames, - - - - -	<i>Secretary.</i>
W. D. LUCAS, Ames, - - - - -	<i>Treasurer.</i>
J. L. GEDDES, Ames, - - - - -	<i>Deputy Treasurer.</i>

The following Standing Committees were appointed:

<i>Executive Committee</i> —Trustees WRIGHT, LITTLE, and McCLINTOCK.
<i>Committee on Farm</i> —Trustees LITTLE, McCLINTOCK, and SHERMAN.
<i>Committee on Horticulture</i> —Trustees SHERMAN, DIXON, and WRIGHT.
<i>Committee on Workshop</i> —Trustees WRIGHT and McCLINTOCK.
<i>Committee on Forfeited Lands</i> —Trustees WRIGHT and SHERMAN.

APPROPRIATIONS OF THE SEVENTEENTH GENERAL ASSEMBLY.

The appropriations of the Seventeenth General Assembly for constructing a Sewer and Horticultural Laboratory, were not, under the terms of the act making said appropriations, available until January 1, 1879. Under the urgent necessity of the case, the sum necessary to construct the sewer was borrowed by the previous Board, and the sewer completed prior to the Legislative appropriation. By the action of the Legislature it was rendered necessary for the Board to secure an extension of the time for repaying the money thus borrowed until the appropriations made by the State could be drawn from the treasury.

At the meeting in May, 1878, the Board found it important to the success of the system of experiments commenced in the Horticultural Department, that the laboratory designed for the use of that department should be built without the delay of a year, which would be rendered necessary if its erection were postponed until the appropriation made by the State for that purpose was available. The Board decided to build said laboratory during the summer of 1878, and for that purpose borrowed of Prof. J. L. Budd the sum of \$2,500, [the amount of the State appropriation], agreeing to pay him, from the Contingent Fund of the College, interest on said sum at the rate of 8 per cent per annum, from July 1, 1878, until payment by the State Treasurer of the State appropriation.

Professors Budd and Beal, under the authority of the Board made all purchases of material and superintended the construction of the sewer. Trustees Dixon and Sherman, and Prof. J. L. Budd, were appointed a committee to arrange, plan for, and superintend the construction of the Horticultural Laboratory. For detailed statement of the sums expended under these appropriations, see report of these committees.

COLLEGE APPROPRIATIONS.

Upon the recommendation of the Executive Committee, the following additional appropriations were made to meet the expenses of the fiscal year ending November 13, 1878:

FROM INTEREST FUND:

For Farm Department	\$ 1,370.00
For Library	175.00
For Ornamental Grounds.....	150.00
For publishing College Quarterly.....	85.00
For purchasing microscope for Horticultural Department.....	40.00
For paying eminent men from different portions of the State for conducting Sabbath exercises in College chapel	100.00

FROM CONTINGENT FUND:

Expenses of A. S. Welch, at Des Moines, in service of College..... 35.00

FROM DONATION FUND:

Salary of G. W. Bassett, as Agent from May 13, 1878, to November 13, 1878 37.50
Expenses of E. W. Stanton making settlement with Agent Bassett..... 6.70
Expenses of J. L. Budd, at Des Moines, in service of College..... 46.60

The appropriations hitherto made were reduced as follows:

Appropriation to College workshop, from\$ 600.00 to \$150.00
Appropriation to Civil Engineering, from..... 200.00 to 150.00
Appropriation for contingent expenses, from 2,000.00 to 1,600.00

The following sums, or so much thereof as might be necessary, were appropriated from the funds mentioned to meet the expenses for the fiscal year ending November 12, 1879:

FROM INTEREST FUND:

For salaries.....\$26,000.00
For fires and lights 2,000.00
For contingent expenses..... 1,500.00
For Farm Department—
For purchasing cows 1,200.00
For purchasing creamery apparatus 500.00
For purchasing Holstein cattle..... 500.00
For purchasing bull, "Oneida Prince," 300.00
For current expenses 1,000.00—3,500.00
For Department of Horticulture and Forestry..... 1,500.00
For Department of Botany—
For current expenses 275.00
For purchasing microscopes 125.00— 400.00
For Department of Entomology 250.00
For Department of Veterinary Science..... 200.00
For Department of Civil Engineering..... 150.00
For Department of Physics..... 225.00
For Department of Military Tactics..... 250.00
For Department of Domestic Economy 315.00
For Chemical Laboratory 225.00
For Workshop..... 700.00
For Museum..... 50.00
For Library..... 1,050.00
For Ornamental Grounds 500.00
For College Printing Office..... 150.00
For Farm House Boarding Department 30.00
For publishing College Quarterly 465.00
For publishing Annual Catalogue 150.00
For furnishing Horticultural Laboratory..... 250.00
For furnishing Botanical Laboratory 280.00
For building water tank 200.00
For purchasing furniture for College building 200.00
For conducting Sabbath service in College Chapel..... 300.00

FROM FARM WOODLAND ACCOUNT:

For building creamery..... 300.00
For repairing barn..... 105.00

FROM DONATION FUND:

For building coal house for Horticultural Department..... 60.00
For repairing house occupied by Secretary..... 50.00

FROM BOILER FUND:

For repairing house occupied by Secretary..... 100.00

In addition to the foregoing, there was appropriated to the various departments the proceeds of all sales made by said departments.

[For the amounts expended under these appropriations, see report of the Treasurer.]

It was directed that all appropriations should be expended under the direction of the President upon consultation with the heads of departments in such manner as not to cause even temporary financial embarrassment to the institution.

OFFICERS.

At the December meeting, Mrs. Margaret P. Stanton tendered to the Board her resignation as Preceptress and Instructor in French and Mathematics. Her resignation was accepted, to take effect March 1, 1879.

Superintendent Robinson was allowed \$4.00 per week for the year ending March 1, 1879, in full of all claims which he might have against the College because of its failure to furnish him with a house upon the College grounds, as agreed.

The sum of \$200 was voted Professor Wynn for services rendered during the year in conducting Sabbath exercises in the College chapel.

The salaries of the various officers of the College were reduced, on an average, about 11 per cent.

The following is a list of the officers of instruction for the year commencing March 1, 1879, and ending March 1, 1880, with the salary of each as fixed by the Board:

A. S. WELCH, LL. D., PRESIDENT,

Professor of Psychology and Philosophy of Science.
Salary, \$3,100.

GEN. J. L. GEDDES, PRESIDENT *pro tem.*,

Professor of Military Tactics and Engineering, Steward, and
Deputy Treasurer.
Salary, \$1,900.

W. H. WYNN, A. M., PH. D.,

Professor of English Literature.
Salary, \$1,600.

C. E. BESSEY, M. S.,

Professor of Botany.
Salary, \$1,600.

- A. THOMSON, C. E.,
Professor of Mechanical Engineering and Superintendent of the
Work-shop.
Salary, \$1,600.
- F. E. L. BEAL, B. S.,
Professor of Civil Engineering.
Salary, \$1,600.
- T. E. POPE, A. M.,
Professor of Chemistry.
Salary, \$1,600.
- M. STALKER, B. S., V. S.,
Professor of Veterinary Science.
Salary, \$1,600.
- J. L. BUDD,
Professor of Horticulture.
Salary, \$1,600.
- J. K. MACOMBER, B. S.,
Professor of Physics, and Librarian.
Salary, \$1,600.
- E. W. STANTON, B. S.,
Professor of Mathematics and Political Economy.
Salary, \$1,600.
- MRS. MARY B. WELCH, PRECEPTRESS,
Lecturer on Domestic Economy.
Salary, \$1,100.
- J. S. LEE, B. S.,
Assistant Professor of Chemistry.
Salary, \$1,000.
- MISS MARTHA SINCLAIR, ASSISTANT PRECEPTRESS,
Instructor in French and English.
Salary, \$700.
- T. L. SMITH, B. S.,
Foreman in the Work-shop and Teacher in Preparatory Department.
Salary, \$500.
- J. C. HIATT,
Superintendent of the Farm.
Salary, \$1,500.
- WINIFRED M. DUDLEY, B. S.,
Teacher of Instrumental Music.
- G. S. FOX,
Teacher of Vocal Music.
- MRS. A. THOMSON,
Housekeeper.
Salary, \$600.
- H. D. HARLOW,
Proctor.
Salary, \$624.

In the cases of Gen. Geddes and Mrs. Thomson, it was provided that they should receive, in addition to their salaries, board during the session of school. All of Mrs. Thomson's, and \$600 of the salary of Gen. Geddes, is paid from the receipts of the Boarding Department. Miss Dudley and Professor Fox receive no salary from the College, but are allowed the tuition paid by students in music.

E. W. Stanton was elected Secretary of the Board of Trustees at a salary of \$200 per annum, commencing November 14, 1878. The house formerly occupied by Gen. Geddes was set aside for occupancy by the Secretary, and arrangements made for its repair. It was provided that after being put in good order by the College, the Secretary should, at his own expense, keep it in first class repair.

President Welch informed the Board of his intention to vacate the house occupied by him. It was ordered reserved for the use of the Departments of Botany and Veterinary Science. The President was allowed the use of one page of the *College Quarterly* for three years in payment for everything connected with the house, aside from furniture owned by him.

Prof. J. L. Budd was appointed to act upon the Judiciary Committee, which committee was increased to seven members.

LAND DEPARTMENT.

The Secretary of the Board submitted his report upon the annual settlement made by him with Agent Bassett, which was read and ordered spread upon the minutes.

The agent was directed not to allow any lessees of College land to pay the principal of their leases until the expiration of the time for which said leases were made. The holders of leases numbers 141½, 1,190, and 1,191 were, upon application to the Board, allowed to make such payment, provided that in addition to the principal, they should pay to the College one-fourth of the unearned annual interest for the remainder of the term of said leases.

The committee appointed to re-appraise forfeited land, reported the following tracts re-appraised during the year:

Endowment Fund Land Forfeited January 8, 1878.

PART OF SECTION.	Section.	Township.	Range.	Acres.	Old price.	Reappraise-ment.
sw qr	26	98	33	160	2 25	4 00
ne qr	12	96	32	160	2 25	5 00
nw qr	12	96	32	160	2 25	5 00
ne qr of ne qr	12	92	40	40	3 75	3 75
sw qr	26	90	24	160	4 50	4 50
se qr	26	90	24	160	4 50	4 50
ne qr	18	97	32	160	3 75	3 75
ne qr	36	87	42	160	4 00	5 00
nw qr	32	88	41	160	4 00	4 00
nw qr	10	86	42	160	3 75	5 00
sw qr	10	86	42	160	3 75	5 00
ne qr	24	98	34	160	2 50	3 00
nw qr	24	98	34	160	2 50	3 00
ne qr	26	98	34	160	3 00	3 00
ne qr	18	87	40	160	3 75	4 00
se qr	36	87	42	160	4 00	5 00
ne qr	22	99	33	160	3 50	4 00
nw qr	22	99	33	160	3 50	4 00
se qr	22	99	33	160	3 50	4 00
sw qr	22	99	33	160	3 50	4 00
sw qr	28	99	33	160	3 50	4 00
sw qr	28	90	33	160	5 50	5 50

Endowment Fund Land Forfeited May 13, 1878.

nw qr	22	98	29	160	1 50	4 00
ne qr	13	95	27	160	3 00	5 00
nw qr	13	95	27	160	3 00	5 00
nw qr	30	95	33	161.29	2 25	3 50
ne qr	30	95	33	160	2 25	3 50

Endowment Fund Land Forfeited July 22, 1878.

sw qr	34	98	29	160	2 25	4 00
ne qr	1	98	30	168.05	2 25	4 00
ne qr	28	93	36	160	5 00	5 00
sw qr	34	95	27	160	4 00	4 00

Endowment Fund Land Forfeited November 21, 1878.

PART OF SECTION.	Section.	Township.	Range.	Acres.	Old price.	Reappraise-ment.
nw qr	8	99	34	160	2 25	3 50
ne qr	8	99	34	160	2 25	3 50
se qr	10	91	40	160	3 75	5 00
nw qr	10	93	36	160	3 00	4 00
sw qr	10	93	36	160	3 00	4 00
ne qr	36	96	34	160	3 50	5 00
ne qr	35	97	27	160	3 00	4 00
ne qr	33	95	27	160	4 00	4 00
ne qr	24	97	34	160	3 00	3 50
sw qr	3	97	32	160	3 00	3 50
sw qr	18	97	32	79.25	4 00	4 00
s hf of nw qr	24	97	34	160	3 00	3 50
se qr	9	95	30	160	6 00	6 00
se qr	30	94	32	159.69	3 50	3 50
sw qr	32	94	33	80	3 50	3 50
w hf of se qr	9	98	29	160	4 00	4 00
ne qr	15	93	27	160	3 00	3 00
sw qr						

Contingent Fund Land Forfeited November 21, 1878.

ne qr	36	90	41	160	2 25	2 25
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The committee reduced the valuation on the following tracts to-wit.: sw. qr. of 22, 97, 30, from \$4.00 to \$2.55 per acre; ne. qr. of 28, 99, 33, from \$5.00 to \$4.00 per acre, the same being the appraisement of said lands at the date of forfeiture. These reductions were made upon the petition of the former lessees of said tracts setting forth that their leases had become delinquent and been forfeited; the one by an oversight, the other on account of losses by the grasshopper visitation. The committee also reduced the valuation on the s. hf. of se. qr. 22, 90, 47, from \$7.50 to \$5.25 per acre—Mr. Wm. B. Treadway, former member of the committee on forfeited lands certifying that the committee were mistaken in the tract of land when the first named valuation was fixed upon it.

CONTINGENT PRINCIPAL FUND.

It was decided by the Board to loan the money arising from the sale of Contingent Fund land on farm mortgages bearing 9 per cent annual interest. G. W. Bassett, of Fort Dodge, Iowa, was appointed the agent of the College to negotiate said loans, under the following contract:

CONTRACT WITH G. W. BASSETT.

This agreement made this 24th day of July, 1878, between the Iowa Agricultural College and Farm, represented by the Board of Trustees, and George W. Bassett, of Fort Dodge, Iowa, *Witnesseth*: That said Bassett is hereby appointed agent of said College for the purpose of loaning the money now in the hands of the Treasurer of said College, and that may hereafter come into his hands, derived from the sale of the lands purchased by J. C. Cusey, with accumulated interest fund, and located in the Sioux City land district.

The terms of such leases shall be as follows:

(1.) The rate of interest shall be nine (9) per cent per annum, payable annually, both principal and interest payable at the office of said agent at Fort Dodge, with current rate of exchange upon New York or Chicago. The time for which said loans may be made shall not be less than five years, and the amount not exceeding two thousand (\$2,000) dollars in any one loan, unless said amount shall be increased by a further order of this Board.

(2.) Said loans shall be secured by a mortgage upon improved farm lands, the actual cash value of which, exclusive of buildings, shall not be less than double the amount of the sum loaned. The borrower shall keep the buildings upon the mortgaged premises insured for the benefit of the said Iowa Agricultural College and Farm, and shall pay all taxes that may be assessed on such premises, and an attorney's fee in case of foreclosure.

Said Bassett shall also receive, at his office in Fort Dodge, the annual interest accruing from loans made by him, and also the principal sums as they fall due, and shall remit the same to the Treasurer of said College, monthly, and shall also make monthly reports to the Secretary of said Board of Trustees, setting forth in detail the collections so made; said Bassett shall also provide for his own use, the blanks necessary for such loans, it being the intent of this contract that said agency shall be conducted without expense to said College.

In consideration of said services and expenses, said Bassett is hereby authorized to charge and collect from the borrower a commission of five per cent upon the amount of such loan, payable at the time said loan is made, and also all costs incurred in procuring abstracts and in the preparation, execution and recording of all necessary instruments of conveyance.

The authority to loan said fund may be revoked by the Board of

Trustees at any time upon notice given to said agent, but it shall be the duty of said agent to receive and remit to the Treasurer of said College the annual interest, and the principal of all loans then made, and outstanding at the time of such notice.

Said agent shall, before entering upon said duties, file with the Secretary of said Board of Trustees a bond in the penal sum of five thousand dollars, with sureties to be approved by said Secretary, conditioned for the faithful performance of all the requirements of this contract.

Upon filing with the Secretary of said Board of Trustees a note, secured by mortgage properly executed and recorded, together with an abstract of title of the mortgaged premises, the said Secretary shall issue to said Bassett, an order on the Treasurer of said College for the amount of such loan, payable out of said fund, and the Treasurer shall, on presentation of said order, remit the amount thereof to said Bassett at Fort Dodge.

In witness whereof, the said Board of Trustees have caused this instrument to be signed by the chairman of the said Board, and attested by the Secretary of said Board, and the said Bassett has hereunto set his hand the date above written.

J. N. DIXON,
Chairman Board of Trustees,
E. W. STANTON,
Secretary Board of Trustees,
GEO. W. BASSETT.

In 1876, a quarter section of Contingent Fund land was sold and the proceeds of the sales, amounting to \$360.00, returned to the Interest Fund. By an order of the Board this amount was transferred to the Contingent Principal Fund, making with the sum of \$1,440 realized from sales made during 1878, a total of \$1,800 to the credit of this fund. At the November meeting, the Board authorized the agent to loan this amount for three years, instead of five, as specified in his contract, provided that he should charge and collect a commission not exceeding three per cent on the loan negotiated.

FARM DEPARTMENT.

Trustees Dixon, Sherman and Little, were appointed a committee to secure a Durham bull for the College Farm. Upon the recommendation of this committee, the bull, "Oneida Prince" was purchased of H. B. Adair for the sum of \$300.

Trustees Little and Sherman were appointed a committee to procure for the farm a Merino, and a South-Down buck. The committee purchased a Merino buck of S. H. Thompson, of Johnson county, Iowa, and a South-Down buck of John Wentworth, Chicago, Illinois, paying \$25 for each.

Superintendent Robinson presented his report of the operations upon the farm during the year, which was read and referred to the Committee on Farm.

J. C. Hiatt was elected Farm Superintendent for the ensuing year, with a salary of \$1,500 per annum for self and wife. It was provided:

- (1.) That his services and salary should commence March 1, 1879.
- (2.) That he should be allowed the use of the farm house and the furniture therein, owned by the College, free of rent.
- (3.) That the furniture should be inventoried by Gen. J. L. Geddes on behalf of the College, and that the said J. C. Hiatt should be responsible to the Board for said inventory, but that he should not be required to make good the natural wear of the furniture.
- (4.) That no student should be boarded in said house without the consent of the President of the College.
- (5.) That he should board the employes of the College Farm at the rate of \$3 per week for each boarder.
- (6.) That in all other cases he should be allowed to charge such reasonable rates as he and the parties seeking board might agree upon.
- (7.) That he should be allowed the use of the vegetable garden connected with the farm house boarding department, free of rent.
- (8.) That he should be allowed the privilege of keeping a horse for his own use upon the College farm, free of expense to himself.
- (9.) That he should be allowed wood in the timber, needed in connection with the running of the house.

Messrs. Dixon, Robinson and Hiatt, were appointed a committee to take an inventory of all property upon the farm—said inventory to be taken prior to March 1, 1879.

J. C. Hiatt, Professor J. L. Budd, and President Welch, were appointed a committee to carefully consider the subject of starting a creamery upon the College Farm. The committee reporting favorably, it was decided to establish the creamery and place it under the charge of Superintendent Hiatt. The sum of \$500 was appropriated from the Interest Fund to purchase apparatus, and \$1,200 from the same fund to procure the necessary cows for the farm.

Trustee Little was appointed a committee to visit the farm when Mr. Hiatt, the newly elected Superintendent, should take possession.

COLLEGE TREASURER.

The Deputy Treasurer submitted to the Board his report of the financial transactions connected with the Treasurer's office for the fiscal year ending November 13, 1878. This report was read and referred to the Executive Committee. [For report, see page 22.]

The report of the Secretary in regard to the account kept by him with the Treasurer, and the monthly examinations of the Treasurer's books and vouchers, made by the Board of Audit, was read and ordered spread upon the minutes. [For report, see page 34.]

The Executive Committee spent several days in examining the books and vouchers of the Treasurer. The committee submitted the following report, which was adopted:

REPORT OF THE EXECUTIVE COMMITTEE.

To the Board of Trustees:

The Executive Committee, to whom was referred the report of the Treasurer, for the fiscal year ending November 13, 1878, beg leave to report as follows:

In addition to the monthly examinations of the accounts of the Treasurer by the Secretary of the Board of Trustees, we have ourselves examined the various items which go to make up the cash transactions of the year. In the course of this examination we have compared the duplicate receipts filed in the office of the Secretary with the debit entries in the Treasurer's cash account. We have examined each voucher and taken note that it was correctly entered in the day-book. We find that the Treasurer has debited himself with all cash received, and that he has proper vouchers for all sums which he claims to have paid out. In voucher number 1,434, we find that the Treasurer has failed to give himself a sufficient credit, having entered the same in his cash book as \$7.22, when it should be \$7.62. With this exception, the cash account is correct.

At the beginning of the fiscal year, there was in the hands of the Treasurer a balance from the previous year of \$184.65. During the year, he has received from all sources the sum of \$65,965.28. During the same time he has paid out as per vouchers, the sum of \$60,346.17, leaving as the cash balance in his hands at the close of the year, the

sum of \$5,803.76. There has also been received by him and forwarded to the State Treasurer, the sum of \$1,580, the same being the amount collected on Endowment Fund land sold during the year.

Besides examining the cash account of the Treasurer, we have made such further investigation of his books as to satisfy ourselves that each department has received its proper debits and credits; that in no case has the sum expended exceeded the amount appropriated by the Board of Trustees; that all expenditures have been closed into the respective funds from which the appropriations were made; that the accounts of the Treasurer are correct, and his report a true exhibit of the financial operations of the year.

By an order of the previous Board of Trustees, it was directed that the accounts of the School-book Department should not be kept in the Treasurer's books, but that the department should be put under the charge of Gen. Geddes, and a record of the transactions thereof entered in a different set of books. We have also examined the books and vouchers of this department and find them correct.

Your committee would make to the Board the following recommendations concerning the keeping of accounts for the coming year:

(1.) That in the School-book Department, all sales, except to the other College departments, shall be for cash; that the student in charge be required to keep an itemized account, in a book ruled for that purpose, of all sales; and that each student, or any other person making purchases, be required to sign his or her name upon said book opposite the list of things purchased.

(2.) That the Board of Audit require that all reports of the heads of departments, and all bills from whatever source, presented for payment, shall be itemized.

(3.) That the heads of departments, and all others making reports to the Treasurer, be required to make such reports in accordance with the method prescribed by him; and further, that the Treasurer shall so enter said reports in the day-book that ready comparison can be made, both by items and by totals, between the day-book and the report.

(4.) That the heads of the different departments be required to prepare their monthly reports, and to hold a formal meeting in the President's office, the President presiding, on the evening of the third day of the month following, or at such other time as the President may designate, for the purpose of comparing said reports and determining the correctness of the charges made by the various departments against each other, and individuals, and that any negligence upon the part of

the heads of the departments in regard to these meetings, be reported by the President to the Board of Trustees.

(5.) That no money belonging to any department of this College shall be paid to the Treasurer, except by the head of the department to which said money is due and that the party making such payment be required to present to the Treasurer at the time of payment, an itemized statement of the sales from which said cash was derived with the dates of each transaction; that the Treasurer file said statement with the Secretary of the Board of Trustees; and further, that each head of a department keep in his books a cash account, of which this monthly statement shall be a copy.

(6.) Your committee deem it important, in order that the Board of Trustees may rightly discharge their duty of making appropriations to the different departments, and of otherwise providing for the maintenance and welfare of the College, that they should at all times be able to obtain in the office of the Secretary of the Board, full information in regard to the condition of all the College funds. To this end they would recommend that the Treasurer of State be respectfully requested to make to the Secretary of the Board quarterly statements of the condition of the Endowment Fund, invested by him, giving an itemized account of all transactions connected with the original fund, or the collection of interest accruing thereon—one of which statements shall be made on the second Wednesday in November, the close of the fiscal year of the College.

Respectfully submitted,

GEO. H. WRIGHT.

WM. McCLINTOCK.

H. G. LITTLE.

Wm. D. Lucas was re-elected Treasurer, at a salary of \$400 per annum, said salary to commence November 14, 1878. The Treasurer was directed to force collection upon overdue notes in favor of the College in all cases where, in his opinion, collections could be made.

MATTERS RELATING TO STUDENTS.

At the commencement of the College, in November, the following students were graduated:

In the Course in Sciences related to Agriculture.—Richard Burke, Harvey L. Glenn, A. Elza Griffith, Julius C. Hainer, David McKinnon,

J. N. Muncey, W. Keltner Robbins, J. W. Whitney and Thomas F. Lee.

In the Course in Science for Ladies.—Florence E. Brown, Emma McHenry, Ellen Rice, Lucy Shepard, Ida Twitchell and Belle Woods.

In the Course in Civil Engineering.—Milan M. Hitchcock, Charles B. Martin, Charles F. Mount, E. G. Tyler and Geo. W. Wilson.

In the Course in Mechanical Engineering.—Joseph C. Meredith.

Upon students graduating in the "Course in Sciences related to Agriculture," or the "Ladies' Course in Science," there was conferred the degree of Bachelor of Science (B. S.) Upon students graduating in the "Course in Civil Engineering," there was conferred the degree of Bachelor of Civil Engineering (B. C. E.); and upon the student graduating in the "Course in Mechanical Engineering," there was conferred the degree of Bachelor of Mechanical Engineering (B. M. E.)

The charges against students for the school year of 1879, were fixed as follows:

Board, per week	\$2.50
Lighting and heating, per week .....	.40
Incidentals, per week .....	.21
Room rent, per term	1.00 to 3.50
Washing, average per dozen .....	.50
Janitor's fee, for students not boarding in the building, per term	5.00

The various changes in the courses of study and laws for the government of the institution, recommended by the Faculty, were, with slight modifications, adopted by the Board.

MILEAGE AND PER DIEM.

The following is the mileage and per diem of the different members for the year:

NAMES.	No. of meetings.	Total No. of miles.	Mileage.	Total No. of days.	Per diem.	Total.
J. N. Dixon	4	752	\$37.60	30	\$120.00	\$157.60
Wm. McClintock	4	1480	74.00	30	120.00	194.00
Buel Sherman	3	1182	59.10	26	104.00	163.10
Geo. H. Wright	4	1760	88.00	30	120.00	208.00
H. G. Little	4	536	26.80	28	112.00	138.80

PROCEEDINGS OF THE BOARD FOR 1879.

During the year meetings were held as follows:

<i>First meeting,</i>	- - - - -	May 21-24
<i>Second meeting,</i>	- - - - -	July 22-24
<i>Third meeting,</i>	- - - - -	November 8-12
<i>Fourth meeting,</i>	- - - - -	November 28-December 4

SCHOOLS.

It was directed that the word "school" should be substituted for "department" in designating the work coming under the different Professors. The course in the Veterinary School was extended one year. Professor Stalker and the President were authorized to arrange the proper studies for said course, and it was provided that the Board would confer a suitable diploma upon students completing the extended course thus established.

FARM DEPARTMENT.

Superintendent Hiatt submitted his report of the operations upon the farm for 1879, which was read and referred to the Committee on Farm.

Trustee Sherman, of the committee to purchase Holstein cattle for the College Farm, reported that he had bought of Dr. Joseph Taft, of Elgin, Illinois, one four-year old cow, paying therefor the sum of \$300. He also procured from Dexter Revery, of Leland, Illinois, a yearling bull, at a final cost to the College, of \$156.

The Farm Superintendent was authorized to sell the scales owned by the Farm Department and purchase a new set if the funds to the credit of the department would warrant such expenditure.

It was ordered that the Farm Department furnish the Horticultural Department with a team, when wanted, at a reasonable compensation, and that the latter department give the former due notice of its intention to use said team.

Arrangements were made by the Board with Professor Knapp, to occupy the farm house upon the following conditions:

- (1.) That he should be allowed the use of the house and the furniture therein free of rent for one year, commencing March 1, 1880.
- (2.) That the furniture should be inventoried by Gen. J. L. Geddes,

on behalf of the Board of Trustees, and that the said S. A. Knapp should be responsible to the College for said inventory.

(3.) That he should not be required to make good the natural wear of the furniture, but that in no case would the College purchase further furniture for the said house.

(4.) That he should be allowed the use of the vegetable garden connected with the farm house, free of rent, and be permitted to keep a cow upon the College Farm upon payment of an equitable consideration for her keeping.

(5.) That he should be allowed to furnish the extra horse required upon the farm, and in consideration therefor, be permitted to use the same for private purposes when not required upon the farm.

(6.) That Mrs. S. A. Knapp be granted the privilege of keeping a boarding-house in connection with said farm house, provided that she accept no students as boarders except upon the consent of the President of the College; that she board the employes of the College Farm at the rate of \$3 per week for each boarder; but that in all other cases she be allowed to charge such reasonable rates as she and the parties seeking board may agree upon.

Professor Knapp was authorized to hire all necessary farm help, upon consultation with the President.

It was ordered, that there be purchased for the Farm ten Poland-China sows, five Berkshire sows and one Poland-China boar; and that Professor Knapp purchase the same for the College, supplying them, as far as possible, from his own herd; the cost of the sows not to exceed \$15 each, but the cost of the boar to be left to his own discretion.

Professor Knapp was empowered to purchase the necessary seeds for his department, the amount so expended not to exceed the sum of \$200, the same to be paid from the appropriation to the Farm.

A contract was made with the College Boarding Department, by which the Farm agrees to furnish that department with milk and butter, for 1880, charging for the milk ten cents per gallon and for the butter twenty cents per pound.

LAND DEPARTMENT.

Mr. Bassett submitted a detailed statement of the transactions of his agency for the two years ending November 1, 1879, which was ordered spread upon the minutes. [For report, see page 37.]

Upon the question of allowing the lessees of Endowment Fund land

to make payment of purchase money prior to the expiration of lease, it was ordered:

(1.) That any persons holding leases or renewals of leases issued prior to the 28th day of March, 1874, upon the lands belonging to the Iowa Agricultural College and included in the Congressional land grant, be permitted to exercise the right of purchase as provided in said leases, upon payment to the agent of said Board of the purchase price of said land and one-fourth of the unearned annual interest for the remainder of the term of such leases.

(2.) That the holders of leases issued subsequent to the aforesaid date, be not allowed to purchase said land until the expiration of their leases.

The committee on Forfeited Lands, reported the following tracts re-appraised during the year:

Endowment Fund Land forfeited March 15, 1879.

PART OF SECTION.	Section.	Township.	Range.	Acres.	Old price.	Reappraisal.
ne qr	22	97	29	160	\$2.25	\$4.00
sw qr	20	90	33	160	3.75	5.00
nw qr	20	90	33	160	3.75	5.00
se qr	2	98	30	160	2.25	3.50
nw qr	1	95	36	175.56	2.70	4.00
se qr	18	97	32	160	5.00	5.00
ne qr	10	97	29	160	4.00	4.00
se qr	2	89	44	160	4.00	4.00
se qr	6	89	44	160	4.00	4.00
se qr	12	89	44	160	4.00	4.00
nw qr	33	99	30	160	3.00	3.00
ne qr	2	98	30	167.27	3.00	3.00
se qr	4	98	29	160	3.00	3.00
sw qr	4	98	29	160	3.00	3.00
sw qr	3	98	29	160	3.00	3.00

Endowment Fund Land forfeited November 17, 1879.

nw qr	28	99	23	160	\$2.25	\$5.00
ew qr	13	94	28	160	2.62 $\frac{1}{2}$	4.00
se qr	3	98	29	160	2.25	3.50
ne qr	26	90	24	160	4.60	6.00
n hf of ne qr	26	90	47	80	5.00	6.50
nw qr	36	94	28	160	4.00	4.00
nw qr	32	97	30	160	3.50	4.00
se qr	36	100	34	160	4.00	4.00
sw qr	36	100	34	160	4.00	4.00
se qr	8	98	27	160	3.50	3.50
sw qr	12	98	27	160	3.50	3.50
nw qr	35	92	49	160	4.00	5.00
ne qr	22	94	39	160	3.50	3.50
se qr	22	94	39	160	3.50	3.56

Contingent Fund Land forfeited March 15, 1879.

sw qr	26	93	36	160	\$2.50	\$5.00
se qr	28	93	36	160	2.50	5.00

Contingent Fund Land forfeited November 17, 1879.

sw qr	28	93	36	160	\$2.50	\$5.00
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Of the land purchased with accumulated interest money in 1868, there was sold in 1870 and 1871, four hundred and eighty acres. The proceeds of these sales, amounting to \$1,040, were credited on the College books to Interest Fund. By an order of the Board, this amount was transferred to Contingent Principal Fund.

OFFICERS.

The President was authorized to employ Mr. Frank W. Booth, as foreman in the printing office and teacher in the College during such portion of the year, 1878, as the interests of the College should require, allowing him \$3 per day as compensation for such service.

A. B. Shaw was elected foreman of the printing office for 1880, at a rate of compensation not to exceed thirty cents per hour. The payment of said compensation was made dependent upon the condition that he should so manage the printing office that neither it nor the *College Quarterly* should exceed the appropriations voted them by the Board of Trustees.

Mr. Charles F. Mount was employed by the President as assistant in the Department of Civil Engineering during the fall term of 1879. For this service he was paid the sum of \$135. At the December meet-

ing the Board elected Mr. Mount assistant in Civil Engineering for the year commencing March 1, 1880, at a salary of \$600 per annum.

Mr. Herbert Osborne was elected assistant in Zoology and Entomology, at a salary of \$300 per annum—services and salary to commence November 13, 1879.

The President was authorized to secure an assistant in the Chemical Laboratory, and the sum of \$300 was appropriated for that purpose.

The instruction in Geology was assigned to Professor J. K. Macomber, in addition to his duties as Professor of Physics and College Librarian.

Miss Carrie Lane was appointed First Assistant in the Library, at the usual compensation allowed for such service, and the President was authorized to employ a Second Assistant Librarian, her services not to exceed two hours per day.

Dr. D. S. Fairchild was elected Professor of Histology, Pathology and Therapeutics in the Veterinary School. It was provided that his lectures before that school should be delivered without expense to the College, but that the President and Professor Stalker should be authorized to collect from the students of his classes a fee for his lectures; said fee to be payable at the option of the student. Dr. Fairchild was also chosen College Physician, to serve without compensation from the College. For his services as a member of the Sanitary Committee, there was ordered paid him from Interest Fund the sum of \$50.

The sum of \$100 was appropriated from Interest Fund to be paid Geo. S. Fox for instructing the Military Band and for taking charge of the music on the Sabbath and at all other public exercises of the College during the school year of 1880.

Mrs. Welch, Lecturer on Domestic Economy, was authorized to visit the schools of cookery in New York, Boston and other places for the purpose of studying the best models and most approved appliances for fitting up the Experimental Kitchen connected with the Iowa Agricultural College; her bill of expenses was ordered paid from the appropriation to Domestic Economy.

The salaries of the following officers were increased: Miss Martha Sinclair, Assistant Preceptress and Instructor in French and English, from \$700 to \$1,000 per annum; Mr. T. L. Smith, Foreman in the Workshop and Lecturer on Architecture, from \$500 to \$700 per annum; H. D. Harlow, Proctor, from \$52 to \$62 per month.

E. W. Stanton was re-elected Secretary of the Board of Trustees, at a salary of \$200 per annum, said salary to commence November 13, 1879.

The following is a list of the officers and teachers for 1880, with their salaries as fixed by the Board of Trustees:

- A. S. WELCH, LL. D., PRESIDENT,
Professor of Psychology and Philosophy of Science.
Salary, \$3,100. Allowed \$150 for conducting Sabbath exercises.
- GEN. J. L. GEDDES, M. Ph., PRESIDENT *pro tem.*,
Professor of Military Tactics and Engineering, Steward and Deputy Treasurer.
Salary, \$1,900.
- W. H. WYNN, A. M., Ph. D.,
Professor of English Literature.
Salary, \$1,600.
- C. E. BESSEY, M. S., Ph. D.,
Professor of Botany.
Salary, \$1,600.
- A. THOMSON, C. E.,
Professor of Mechanical Engineering, and Superintendent of the Workshop.
Salary, \$1,600.
- F. E. L. BEAL, B. S.,
Professor of Civil Engineering.
Salary, \$1,600.
- T. E. POPE, A. M.,
Professor of Chemistry.
Salary, \$1,600.
- M. STALKER, B. S., V. S.,
Professor of Veterinary Science.
Salary, \$1,600.
- J. L. BUDD, M. H.,
Professor of Horticulture.
Salary, \$1,600.
- J. K. MACOMBER, B. S.,
Professor of Physics, and Librarian.
Salary, \$1,600.
- E. W. STANTON, B. S.,
Professor of Mathematics and Political Economy, and Secretary of the Board of Trustees.
Salary, \$1,800.
- S. A. KNAPP, A. M.,
Professor of Practical and Experimental Agriculture.
Salary, \$1,600. Allowed \$150 for conducting Sabbath exercises.
- D. S. FAIRCHILD, M. D.,
Professor of Histology, Pathology and Therapeutics.
Allowed fees collected from students in Veterinary School.

- MRS. MARY B. WELCH, PRECEPTRESS,
Lecturer on Domestic Economy.
Salary, \$1,100.
- MISS MARTHA SINCLAIR, ASSISTANT PRECEPTRESS,
Instructor in French and English.
Salary, \$1,000.
- T. I. SMITH, B. S.,
Foreman in the Workshop and Lecturer on Architecture.
Salary, \$700.
- A. B. SHAW, B. S.,
Foreman and Instructor in the Printing Office.
Thirty cents per hour for time employed.
- C. F. MOUNT, C. E.,
Assistant in Civil Engineering.
Salary, \$600.
- HERBERT OSBORNE, B. S.,
Assistant in Zoology and Entomology.
Salary, \$300.
- WINIFRED M. DUDLEY, B. S.,
Teacher of Instrumental Music.
Allowed the tuition charged students.
- G. S. FOX,
Teacher of Vocal Music.
Allowed the tuition charged students and \$100 for instructing Military Band and taking charge of Chapel music.
- MRS. A. THOMSON,
Housekeeper and Assistant in Experimental Kitchen.
Salary, \$600.
- H. D. HARLOW,
Proctor.
Salary, \$62 per month.

The salary of the house-keeper, and \$600 of the salary of the Steward, are paid from the receipts of the Boarding Department. Both are allowed board during the school year. A house upon the College grounds is set aside for occupancy by the Secretary of the Board of Trustees; also one for the use of the Superintendent of the workshop.

GRADUATION AND DEGREES.

At the commencement of the College in November, the following students were graduated with the usual degrees:

In the Course in Sciences related to Agriculture.—George Crary Faville, Thomas Volney Hoggatt, James Edward Hyde, Lewis Logan

Manwaring, John Clemmins Noble, Herbert Osborne, Warren Morey Scott, James Duncan Shearer and James Milton Waugh.

In the Course in Mechanical Engineering.—William Graham McConnon, Fremont Turner and Willis Whited.

In the Course in Civil Engineering.—Francis A. Field, Frederic Holton Friend and Albert L. Hanson.

In the Ladies' Course in Science.—Sylvania Caroline Carter, Malinda Cleaver, Lily May Croy, Jennie Elizabeth McElyea, Genevieve Welch and Alice Whited.

Post-graduate degrees were conferred as follows: The degree of Civil Engineer (C. E.), upon Charles F. Mount; the degree of Master of Philosophy (M. Ph.), upon A. E. Griffith.

Upon the recommendation of the Faculty, the Board conferred the degree of Master of Philosophy (M. Ph.), upon Gen. J. L. Geddes and the degree of Master of Horticulture (M. H.), upon Professor J. L. Budd.

MATTERS PERTAINING TO STUDENTS.

It was ordered that, commencing with 1880, all able-bodied students, except the Senior Class and such others as the Faculty may, for good reason, excuse, be required to uniform and drill.

It was directed that the College societies be required to consult the President, and obtain his approval of all arrangements they may make for securing a lecturer for the evening set apart for them in the programme of commencement week, and that said societies be required to pay all the expenses connected with said lecture.

A large number of students having petitioned the Board to provide instruction in Elocution, the matter was referred to the President for such action as he shall deem for the best interests of the College.

COLLEGE TREASURER.

The report of the Deputy Treasurer for the year ending November 12, 1879, was read and referred to the Executive Committee. [For report in full, see page 29.]

The report of the Secretary of the Board of Trustees upon the proceedings of the Board of Audit and the monthly examinations made of the Treasurer's books and accounts was read and ordered spread upon the minutes. [For report in full, see page 34.]

The Executive Committee spent several days in examining the books

and vouchers of the Treasurer. As a result of their examination they reported to the Board that they were satisfied that the accounts of the Treasurer were correct.

Mr. Lucas having been elected a member of the Eighteenth General Assembly, was not a candidate for re-election as Treasurer of the College. At the expiration of his term of office, the following resolution was adopted by the Board:

Resolved, That at the close of the services of William D. Lucas, as Treasurer of the Agricultural College, this Board tender to him their hearty thanks for the faithfulness and ability with which he has discharged the duties of that important office.

W. M. Greeley, of Ames, was elected Treasurer for the fiscal year, commencing November 13, 1879, at a salary of \$500 per annum.

COLLEGE APPROPRIATIONS.

The sum of \$219.53 was appropriated from Interest Fund to Professor J. L. Budd, in payment of interest due January 1, 1879, on money borrowed of him to construct the College Sewer and the Horticultural Laboratory. There was received from the State as interest on the warrants issued for these appropriations, the sum of \$38.53. This amount was also ordered paid to Professor Budd, as part payment of the interest on said loan from January 1, 1879, to the date of the repayment of the money borrowed.

To cover the expenses of the fiscal year commencing November 13, 1879, the following appropriations were made:

FROM INTEREST FUND:

For salaries.....	\$25,850.00	
For fires and lights.....	1,500.00	
For contingent expenses.....	1,500.00	
For Farm Department—		
For current expenses.....	\$1,000.00	
For purchasing cows and hogs.....	800.00—	1,800.00
For Department of Horticulture and Forestry.....		700.00
For Department of Botany.....		242.50
For Department of Entomology.....		250.00
For Department of Veterinary Science.....		242.50
For Department of Civil Engineering.....		150.00
For Department of Physics.....		225.00
For Department of Military Tactics.....		250.00
For Department of Domestic Economy.....		400.00
For Chemical Laboratory.....		225.00
For Workshop.....		450.00
For Museum.....		100.00
For Library.....		1,050.00

For Ornamental Grounds	\$ 300.00
For College Printing Office	168.88
For Horticultural Laboratory	100.00
For publishing College Quarterly	400.00
For purchasing case for Musical Department	25.00
For payment of Prof. Fox's services instructing Military Band and taking charge of music at public exercises	100.00
For payment of Dr. Fairchild's services on Sanitary Committee	50.00
For preparing Biennial Report for filing in Governor's Office	50.00

In addition to the above, there was appropriated to the different departments the proceeds of sales made by said departments.

MILEAGE AND PER DIEM.

The following is the mileage and per diem of the different members for the four meetings held during the year:

NAMES.	No. of meetings.	Total No. of miles.	Mileage.	Total No. of days.	Per diem.	Total.
J. N. Dixon	4	804	\$ 40.20	26	\$104.00	\$144.20
Wm. McClintock	4	1480	74.00	25	100.00	174.00
Buel Sherman	4	1576	78.80	26	104.00	182.80
Geo. H. Wright	4	1800	90.00	25	100.00	190.00
H. G. Little	4	536	26.80	24	96.00	122.80

E. W. STANTON, *Secretary.*

CONDITION AND OPERATIONS OF THE FARM DEPARTMENT, 1879.

J. C. HIATT, SUPERINTENDENT.

To the Board of Trustees:

GENTLEMEN—In accordance with the law, I hereby submit a report of the management and operations of the Farm Department for the year ending November 12, 1879:

The season has been very dry, but better than the average for crops, and I have raised enough of all kinds of produce to supply the stock for the coming year. The kinds, and the quality of each kind of produce raised, are shown in the following table:

	ACRES.	BU. PER ACRE.	TOTAL.
Corn	65	57	3540 bushels
Oats	30	45	1350 bushels
Rye	23	29	683 bushels
Hay			106 tons
Turnips	1		60 bushels
Potatoes	1 $\frac{1}{3}$		240 bushels
Wheat (experimental)	10	14	140 bushels

The quality of everything is good, with the exception of a few varieties of experimental wheat. It will be seen that the yield of sixty-five acres in corn was 3,540 bushels, worth, at twenty-five cents per bushel, \$885. The total cost of raising and putting in the crib was \$521.54, or fourteen cents per bushel, or \$8.02 per acre. If we had raised thirty-two bushels per acre, there would have been no profit; but if we had raised eighty bushels, which ought to be the minimum with favorable seasons, when we get the land in the high state of cultivation necessary to successful farming, then our corn would cost only ten cents per bushel, giving the good farmer a profit of fifteen cents per bushel, where the average farmer hardly gets pay for his labor.

The season was too dry for a good yield of oats. The seed on hand being mixed, no pure varieties could be sown. Thirty acres pro-

duced one thousand three hundred and fifty bushels, or forty-five bushels per acre, worth at twenty cents, \$270. The total cost of raising was \$163.43, or twelve cents per bushel, nearly \$6 per acre. Thirty bushels per acre would pay for raising, and sixty bushels would make a nice profit of \$6 per acre.

Superintendent Robinson seeded twenty-three acres to rye, part of which was injured by being flooded last fall. The yield was six hundred and eighty-three bushels; about thirty bushels per acre, worth forty cents per bushel, or \$273.20. The cost was \$147.90, or twenty-one cents per bushel, leaving a profit of \$125.30, to which should be added fall and spring pasturage.

Several pieces of land, amounting in all to ten acres, were devoted to experiments in wheat. The soil varied from a dark to a light sandy loam. The seed was sown broadcast and the ground harrowed and rolled until it was in very fine condition. The varieties sown were Minnesota White Fife, Scotch Fife, Improved Fife, Lost Nation, Golden Globe and White Russian. On the third day of May, I scattered four hundred pounds of salt on one acre; on another, four hundred pounds of gypsum. Again, on the sixteenth day of June, I scattered three hundred pounds of salt on another acre. My records show that on that day all the varieties were badly rusted, and there was very little difference in the appearance of any of the plats, those receiving the salt and gypsum being a shade darker than the others. At about the middle of July, the chinch-bug appeared, and seemed to rather like his wheat salted. A small piece of fall wheat also was badly injured by rust.

The total yield of wheat was one hundred and forty-one bushels, valued at \$137.39—cost, \$76.37. I would not recommend any of the varieties tried this year, though the Scotch or improved Fife, for hard wheat, and the Golden Globe, for soft wheat, did better than any of the other varieties tried. We are making an effort to introduce several varieties of the Russian wheat and oats, hoping to find something adapted to our soil and climate. The past two seasons have been favorable to the growth of fall wheat, but I have little faith in any known variety being grown with certainty, when we have our cold, dry winters. Besides, very few farmers have their farms divided into fields so that the stock can be kept from injuring the wheat in the fall and spring, when it is tender. Another difficulty is, to secure a proper rotation of crops.

The total number of cattle is one hundred and one. All have been healthy and have done well. Not one has died. Fifty-two calves were dropped, and all were saved but one. I have kept thirty-five of the best calves, viz.: twenty-seven Grades, seven Short-Horns and one Holstein.

The herd of thorough-bred Short-Horns consists of two bulls, twelve cows and heifers and seven calves—twenty-one in all. This number will be reduced to about fifteen. Only the best animals of the best families will be kept, not for the purpose of raising fancy stock, but that we may have good specimens for the use of classes in stock-breeding, and that we may have a few well bred animals to sell to the patrons of the College, and others, at reasonable prices. This year, the demand has greatly exceeded our supply. All found ready sale; calves nine to twelve months old, \$100; younger ones, \$60 to \$75 each.

HOLSTEINS.

These cattle are comparatively little known in the West; only a limited number having been imported from North Holland. They are large and well formed, but not as fine as the Short-Horns; color, jet black, and clear white. They have a great reputation for milk, though perhaps, more on account of quantity than quality. Their milk is not so rich as that of the Jersey, but the yield being so much greater, it is believed by many that they will be more profitable, even for butter. Their calves are large, and make very superior veals. The Trustees purchased a four-year-old cow and a yearling bull, of this breed, for the purpose of starting a small herd on the College Farm. The cow raised a very fine calf, and the bull has been used on a number of our grade cows, hoping to improve our dairy stock.

Only one thorough-bred Jersey, one Devon, and two Ayrshire cows remain on the farm. It would be advisable to purchase two or three good Jersey cows and a bull, but the Devon and Ayrshires need only be kept as specimens for the class in stock-breeding.

We have on the farm, seven head of work horses—two geldings and five mares; also two young mares and three colts. One team is used by the Horticultural Department. Most of the horses are old, and should be sold and two good young teams be purchased. The Horticultural and Experimental Departments ought to have teams of their own.

We have seventy-five head of sheep in all; twenty-five selected South-down ewes, twenty-five selected Merino ewes, two Cotswold

ewes, ten South-Down bucks, five Merino bucks, and eight wethers. The wool clip this year, averaged seven pounds per head, and was sold for twenty cents per pound; the Merinos averaged about nine pounds and the South-Downs about four and a half pounds, but the South-Down wool was worth four cents per pound more in the market.

On account of the prevalence of the cholera among the swine on the College Farm last year, I thought it best not to purchase any valuable animals. Seven hogs died soon after the first of March, but since that time, all have been healthy. Not many pigs were raised. The males were mostly sold for breeding purposes, and the best sows kept for our own use. Only pure bred Poland-China and Berkshires are kept. We stand in great need of a good hog-house.

CREAMERY.

Since the first of March, a neat and convenient creamery building, sixteen by twenty-four feet, has been erected without cost to the State. All the necessary apparatus, including an engine and boiler, churn, butter-worker, Cooley creamer, milk-vat, cans, buckets, etc., have been supplied at a cost of \$379.50. We have furnished all the milk and made nearly all the butter used at the College. Some butter had to be purchased, towards the last of the term, at a cost greatly exceeding what we receive for it, or there would have been a small profit over and above all expenses. All the work of milking and butter-making was done by students. About fifty cows were milked, thirty of them raising their calves. Fully one-half of the cows on the farm, are not profitable milkers, and ought to be disposed of as soon as better ones can be supplied. I think the only way to ensure good milkers, is to raise them on the College Farm, and to that end I have saved all the best heifer calves. Fifteen cows should be purchased to replace those sold at the sale.

STUDENT LABOR.

I found students willing to work, and many of them efficient hands. Under the present regulations, we are required to furnish each student twelve hours work per week. Now, with one hundred and fifty male students, if all demand their twelve hours, we would have to furnish one thousand eight hundred hours, one hundred and eighty days, or thirty hands each day with work, which would be about twenty more than could be profitably employed. Another disadvantage is that the driver to each team must be changed twenty times each week, a thing that cannot be done with good results. We agree to furnish students

with work, but require no guaranty of them to perform that work when needed; consequently, in time of haying, threshing and corn-husking, we are short of help, while at other times we have a large surplus. This difficulty cannot be wholly obviated without a change in the school year; for, at present, examinations come in the haying season, and Commencement in time of corn-husking. I would recommend that no definite amount of work be guaranteed to students, but that the departments be required to give preference to student labor.

FARM IMPROVEMENTS

Under this head are a great many charges and a very few credits. This year I have built four hundred and twenty rods of new barbed wire fence; rebuilt, out of partly new material, two hundred and sixty rods; also one hundred and fifty-seven rods of extra strong board fence, enclosing a bull pasture, have been constructed—the total cost of all being \$720. For seven hundred and ninety-three loads of manure we charged Farm Improvements, \$125; for lumber and labor on cow-stable, \$150; sheep and butcher sheds, \$63; scales, complete, \$150; ditching, \$47. H. H. Robinson had expended before the first of March, 1879, \$200, mostly for building new fence. The balance of \$293.48 was used in keeping in repair some eight miles of fence, purchasing and sowing grass-seed, cleaning up corners and many other things incidental to keeping up a farm. At least one thousand dollars should be inventoried to the credit of the Farm Improvements.

FINANCIAL STATEMENT.

The following shows the result of the year's work:

	LOSSES.	GAINS.
Corn-field		\$363.49
Oat-field		106.57
Rye-field		125.30
Experimental wheat		76.37
Hay-field		143.92
Potato-field		32.57
Root-field		11.75
Teams		53.92
Pasture		32.40
Farm tools	424.11	
Produce	288.68	
Creamery	74.51	
Farm Improvements	1,538.48	
Stock		193.51
Increase in inventory		715.89
	\$2,325.78	\$1,855.69

Farm Improvements should be credited with \$1,000: the improvements made this year enhancing the value of the farm that amount. Farm tools were inventoried last year \$345.75 too much. This amount should, therefore, be deducted from the loss on farm tools, to give a true showing for this year's work. These changes made, the net profit for the year would be \$875.66. It should be taken into consideration that all the hands have been paid liberal wages, and boarded; and that employment has been given to a large number of students, who, without its aid might not have been able to remain in the institution.

The above is respectfully submitted without further recommendations.

J. C. HIATT,
Farm Superintendent.

CONDITION OF THE DEPARTMENT OF HORTICULTURE AND FORESTRY, 1879.

J. L. BUDD, PROFESSOR.

I am pleased to report satisfactory advances in nearly all the divisions of this department.

In my initial report of 1877, an outline was given of proposed lines of improvement and experimentation, and of the imperative wants and needs in the way of buildings and fixtures, which could alone be supplied by the State Legislature.

The prescribed space at this time will be given to a brief statement of the progress we have been enabled to make. All details of minor experiments, descriptive notes on new fruits, speculative comments on modes and methods, etc., will be excluded as more appropriate for the pages of the *College Quarterly*, which is widely circulated in the State.

HORTICULTURAL BUILDING.

I place this first in the list of desirable attainments for reasons self-evident to practical horticulturists.

When the report of 1877 was written not a single dollar had yet been appropriated by the Legislature for facilities for propagation, storage or class instruction, in this important department. A small, low, wet, rotten-timbered cave, constituted the horticultural headquarters.

At the last session of the Legislature the College Board asked for an appropriation of \$3,500, for the erection of a neat, durable, and sufficiently commodious building for class room, office, seed room, cellars for storage, etc. They also asked for the sum of \$2,500 for the construction of a neat, durable, and ample-sized propagating and plant-house, for the combined use of the Horticultural and Botanical Departments. The total amount *actually* appropriated for these purposes, so virtually important to the State at large, was \$2,500; and this totally inadequate sum was not available, by the special provisions of the Act, until 1879.

As absolutely no progress could be made in the practical work, leading me to take charge of the department with existing lack of facilities, the Board permitted the erection of the building with funds advanced by the writer, and the rooms were in actual and profitable use several months before the appropriation was available.

The Building Committee secured unusually favorable rates for all material and labor used; yet the spreading of so small a sum over so much ground compelled the use of cheap material, the cheapest possible plans of construction, and inconvenient restriction of size of needed rooms. Yet I am happy to state that this tardy and limited appropriation has permitted the accomplishment of much valuable work in experimental horticulture, and has furnished fair facilities for the present horticultural classes.

EXPERIMENTAL NURSERY.

The work outlined in this division was the cultivation of varieties of the apple and other fruits, in a systematic way, from northern sections with climatic and soil conditions nearly identical with those of our prairie States.

In this work, I have, in some respects, been far more successful than our most hopeful fruit growers could have expected, with the information we had relative to the fruits of Northern Europe and Asia, two years since.

I am pleased to report that we now have a far greater number of varieties of the apple and pear, which we have reason to believe truly "Iron Clad," than have hitherto been found in our collection in any age, or in any country.

In this work we have received the generous aid of many fruit growers and societies. Especially are we indebted for contributions and favors to Dr. T. H. Haskins, Vermont; Charles Gibb, Abbottsford, Canada; Charles Downing, Peter Barry and Isaac Hicks, New York; Prof. C. S. Sargent and S. W. Williams, of Massachusetts; Hon. Wm. G. Le Duc and William Saunders, Washington; Wm. A. Springer, A. G. Tuttle, J. C. Plumb, and G. P. Peffer, of Wisconsin; Peter M. Gideon, of Minnesota; Hon. Geo. F. Seward, Pekin, China; Dr. E. Regel, St. Petersburg, Russia; and Dr. Arnold, Director of the great Agricultural Institute near Moscow, Russia.

Including the varieties alone quite certain to prove defiant to all our climatic extremes, we now enumerate in nursery over four hundred.

In number, we now have about forty thousand trees, one and two years old, in nursery.

A large portion of the trees have been grown from scions imported from Northern Europe. In making this valuable collection the most careful discrimination has been used as to the size, appearance and character of the fruit.

The future planting of varieties producing small inferior fruit, just because the trees can bid defiance to wind and weather, should be discouraged, unless planted as stocks upon which to top-work better fruit.

The varieties we have in nursery from Vermont, Canada, Wisconsin, Minnesota and local sections of Northern Iowa and Illinois, all have a good record as to character of fruit, as well as hardiness of tree.

The Russian varieties of the apple have not been imported at random. We were especially fortunate, in this matter of intelligent selection, in securing the aid of the Horticultural Manager of the great experimental station at Petrovsk, near Moscow. His selection from the great number of varieties grown in that section, embraces forty-one sorts of winter apples and eighty-four fall and early winter varieties. All these, with seventy-five summer varieties, he forwarded with the assurance that they were, without exception, of good size, appearance, and quality. Several of them are described as sweet, some as sub-acid, and a few as very acid, and only fit for culinary use.

The character of soil and subsoil, the range of summer temperature, and the variability of air as to alternate aridity and humidity of this interior section of Russia, are so nearly identical with ours, that we have every reason to believe that these fruits will vary but little in size, color, or season for use, when grown on the Iowa prairies. As to season of maturity, we have some examples from which we may fairly judge of the prospective behavior of them all. The Oldenburg, Tetofsky, Rannet Red, Borsdorf, and other varieties fruiting in this country correspond in season with the Moscow list.

The varieties we have imported from the nurseries of Dr. Regel, at St. Petersburg, include a number of fall and winter sorts not found in the Moscow list. These varieties do not mature well at St. Petersburg, on account of the short, cool summers. Most of those sent us were secured from the interior sections, farther south, near Kalouga and Simbrisk. In our report two years ago, the following allusion is made to the Russian fruits: "It will be expected that a large portion of these varieties will prove summer and fall apples; but about all of

them will be of fine size, and appearance, and the product of the experimental orchard can be utilized in the College Boarding Department, more especially as all of these northern apples are first-class for culinary purposes. If among them all we get a single half dozen 'Iron Clad' winter varieties, the experiment will prove of inestimable value to the State."

My extended correspondence since that time with fruit growers and scientists of the north of Europe and Asia, has much modified this modest belief as to the value of these fruits. We now have the most indubitable proofs that from two to three hundred miles south of St. Petersburg, and the same distance from the coast line, where the longer, dryer, and warmer summers permit the ripening of winter varieties of the apple, there is no lack of sorts for all seasons and uses. So far from all of the varieties being acid and specially fit for culinary use, quite a large proportion of them are listed as sweet and sub-acid.

We now confidently predict that many of the varieties we have in nursery from this region will prove just what we have been seeking for during many years past, viz: Good keeping sorts, of large size and good quality for different uses, produced on trees capable of enduring any phase of our climate.

A recent letter from Dr. Regel encourages this belief. He states that a few of the varieties sent to the Department of Agriculture in 1870 are winter sorts in their respective localities of that country. In the short list of these which he enumerates he includes at least three which have fruited in Vermont and Wisconsin, viz: Red Queen, Borsdorf and Repka Malenka. All of these are larger in size, better colored, and fully later in season for use than indicated in his list.

The varieties of the pear imported from St. Petersburg and Moscow, now growing in nursery, have attracted much attention. They are all as peculiar in leaf and habit of growth as are the Russian apples. Uniformly the leaves are thick and coriaceous, and growth is vigorous in the early part of the season, without a trace of leaf-blight at any stage of growth. The one year old plants matured their terminal buds as early in autumn, and as perfectly as did the crabs or the Oldenburg. Yet these pears divide into two classes in leaf and habit of growth. One class has the large finely serrated leaves and rampant growth of the Chinese pears. The other has small, thick, crenated leaves, and the slow, short jointed growth of the wild pears of northern European forests. We expect all of them to prove hardy on our prairies, and we expect them to be less subject to blight than the pears we have

tried. The fruit is represented to be of good size, and of excellent quality for culinary use. But we have the direct assurance of Dr. Arnold and others that none of the pears, hardy in the open air of central Russia, are as fine grained and delicious for dessert use as the French and Belgian sorts. Yet we are told that some of those grown in the interior are fair in quality for eating.

We as yet have in nursery only six of the Chinese pears, and these are not from the sections of the great empire leading us to believe them to be entirely hardy with us. Some of them were soft and immature when cold weather set in. But the Chinese sand pear, and two others evidently of the same descent, matured perfectly, and give evidence of hardiness. The sand pear has been fruiting for a number of years in the Eastern States, where it has been notorious for heavy fruiting, and exemption from all traces of leaf or fire blight. If it proves entirely hardy here it will prove more of an acquisition than in sections where a better class of the pear, and the quince, can be profitably grown. Though worthless for eating, its beautiful orange-like fruit has a delicious quince flavor when cooked. In leaf and texture of wood it more nearly resembles the thorn than the pear, and we have reason to believe it will succeed famously on thorn stocks. Its seedlings are now commanding fancy prices at the East on account of the belief that they are blight proof, while producing abundant crops of fruit commanding a good price in the markets.

Some of the Russian pears of the Chinese type of leaf and wood have shown an aptitude for perfect uniting with, and rapid growth, when worked on apple stocks. This season in nursery they seemed to unite better, and to make far better growth on the apple than on pear stocks. Some time must however elapse before we can be sure that the apple will make a suitable stock for any of these northern pears.

We expect to receive consignments of pear scions from northern China, and from central Sweden, the current winter.

We have every reason to believe that in the near future we shall have, as the result of crossing with these northern forms of the pear, hardy blight-proof varieties, producing choice fruit, which will do as well on our prairies as our hardiest apples. In the meantime first-class cooking pears will be a desirable acquisition.

An importation of cherry and plum scions was made from St. Petersburg and from Moscow. But we regret to report that they came in bad condition, and not a single scion has grown. Even in our home nursery work it is known that scions of these fruits are difficult to

manage so as to give uniform success in grafting. We will try to import some small trees of the northern plums and cherries as soon as means at the disposal of the department will permit. It is proper to state in connection that we have made arrangements for the importation of pits of the rather inferior peaches grown in the hilly regions of interior northern China. We have reason to believe they will prove hardy here. If so, they may prove the parent stock of a race of good peaches, far hardier than those from southern Europe.

We are also making such additions to our lists of hardy shrubs, small fruits, conifers, etc., from northern Asia, as our means and opportunities permit, for trial in our rough climate.

Our extended correspondence, of the past two years, impresses the belief that the northern portions of the eastern continent contains many species and varieties of fruits, ornamental and forest trees, shrubs, cereals, grasses, etc., which will prove treasures on our prairies when introduced and disseminated. In this belief we have the support of eminent scientists who have given the subject careful attention. Some of the most promising sections of this vast section, such as northern Bokhara and Ladak, we as yet have no method of reaching.

EXPERIMENTAL ORCHARD.

I have been reasonably successful in carrying forward the plans outlined in last report. About one thousand trees have been planted as stocks, mostly Gros Pomier and Duchess. On these have been top-worked the Russian varieties before noted, with a view to careful comparison of relative value and season of fruit. The grafts have uniformly grown well, with the exception of about two hundred trees grafted the past spring just preceding a remarkable south and southwest gale of five days duration, during most of which time the air was nearly as dry as that from the Sahara desert. A large proportion of these will have to be re-grafted next spring.

The orchard will be extended next spring with root-grafted trees from the nursery of many new varieties from the north not yet fruited in the State. Gros Pomier and Duchess trees will also be planted, upon which to top-work half-hardy sorts, such as Jonathan, Grimes' Golden, Dominie, Maiden's Blush, and Rambo, with a view to careful noting of influence of stock upon graft. A part of these stocks will also be top-worked with the seedlings now in nursery, grown from seeds of selected fruits of our best varieties grown in central and northern Iowa.

THE ORCHARD.

The older orchard, planted with over one hundred varieties common to our nurseries, many of which are far from being hardy in Story county, was in bad condition three years since. It is located in a sheltered position, and the trees had suffered severely with blight and sun-scald of the trunks. The plan has been kept up for three years of plowing the ground lightly about the 20th of June and sowing to buckwheat. Since this treatment has been given not a blighted twig has been seen on any variety in the plat of ten acres. This is worthy of notice in connection with other experiments instituted with a view to testing the results of soil-shading in orchards. Many observations lead to the belief that our intense summer heats have something to do with the general prevalence of apple tree blight on our prairies. Be this as it may, the shading of orchard soils during the latter part of summer with a succulent and cool growth of buckwheat has been repeatedly demonstrated to be favorable to the health and fruitfulness of our orchards.

This orchard is in many respects instructive to our students in Horticulture. The folly of planting varieties unsuited to our soil and climate, is exhibited on every row. At every point a row, or part of a row set with Fameuse, Ben Davis, Gros Pomier, Plumb's Cider, Saxton, Duchess, etc., is usually perfect, and about every tree of the original planting in place. But the many rows of less hardy sorts give every gradation from utter extinction to varied stages of disease and decay.

SMALL FRUITS.

The vineyard is not, in all respects, creditable to the Institution. Where located the soil is specially porous, and the vines of the original planting, having been planted too near the surface, have been so injured in their roots, in their first stages of growth, that they still seem low in vitality.

About four hundred vines used for replanting the many vacancies in the vineyard, two years ago last spring, which were planted two feet deep and the holes gradually filled as they extended in growth, are now strong and vigorous, and gave far more fruit the past season than all the balance of the vineyard.

Of the new varieties recently planted the Lady, Moore's Early, Coe, and Worden, are the most promising. The Haskell Seedlings are too

fragile in leaf to maintain perfect health during our hot, dry summers.

The strawberry crop has been unusually good the past two seasons, and finer specimens are not often seen in any State than those which have graced the tables of the boarding hall.

Of the older varieties we can safely say that Downer's Prolific has given the best satisfaction as to bountiful yield, even size, and quality for table use. For a shipping variety it is probably too little colored, and when ripe lacking the requisite firmness. Green Prolific, when properly fertilized, has followed closely in yield, size, and quality. Next in order we place Wilson, the best market variety of them all. Charles Downing adds to its former record each year. It produces some less fruit than the preceding, but its extra large and even size, and its unsurpassed quality give it a prominent place in the list of most desirable sorts. In our climate it gives far better crops when adjoining such bountiful pollen producers as Downer or Wilson. Kentucky takes the lead among the latter varieties. It is perfect in flower, and bears fair crops of very large and very good fruit.

Of the thirty or more newer varieties we have in plantation, we can only say, as yet, that several of them are very promising. Further experience is needed to enable us to report any of them superior to the older sorts we have named. We can advise careful trial of Red Jacket, Captain Jack, Crescent Seedling, Pioneer, Duchess, Centennial, Triumph, and Forest Rose. Yet it is too early to name these in the order of their merit, and indeed we may with further experience reject some of those named for others in the collection. We have grown from seed about two hundred new varieties, from which we expect soon to select some valuable sorts for prairie planting. We have reason to be hopeful of desirable results, as the seedlings are the offspring of a systematic system of crossing.

The old raspberry plantation has been plowed under. It was planted on the same loose, porous soil as the vineyard. It has borne little fruit, but has proven a fine place for the students to get specimens of raspberry stem fungus. Beyond all reasonable doubt the condition of these canes as to fungoid development, was largely due to the lowered vitality induced by severe root-freezing on this porous soil. The new plantation, on firmer soil, exhibits as yet no traces of the disease, though most of the tips came from the old plot.

The Turner is the best red, and the Mammoth Cluster is the best black variety yet fruiting on the grounds. It is notorious that we have

no variety as yet perfectly hardy on our northern prairies. Even the Philadelphia last winter was killed to the snow line, and the Black Caps were so lowered in vitality as to produce little fruit that was worth picking.

We have, for trial, a raspberry from Manchuria, in leaf and cane looking like a cross of this fruit with the blackberry. Prof. Sargent reports its fruiting in Massachusetts, and its fruit to be "large, firm, clustered, of a brilliant scarlet color, and with flavor much like the Black Caps." If this proves perfectly hardy and its fruit is not what it should be in quality, we may expect its seedlings soon to give us the coming raspberry for the prairies. A variety of the raspberry we have from Russia seems to be trailing in its habit.

VEGETABLE GARDEN.

This is mainly managed with a view to supplying the College Boarding Department with fresh and seasonable vegetables. Something in the way of experimentation is done in noting the relative success of all the newer and best older varieties, under similar and varied treatment; yet we have no results to record worthy of the space they would occupy, with the exception, perhaps, of our trial of about two hundred of the newer or not widely known varieties of the potato. With two and three year's trial, we have rejected one hundred and thirty of the varieties as unworthy of dissemination for western culture.

Of the seventy varieties retained, and exhibited at the recent State Fair at Des Moines, perhaps not more than twenty will be found to rank with, or ahead of the Early Rose, Snow-Flake, and Peach-Blow.

In this list of twenty or more, we however expect to find varieties equal to the Peach-Blow in quality and market value, earlier in attaining growth in the fall, and less objectionable as to depth of eyes. We also expect to find an early potato equal in yield to the Early Rose, and better in quality for early summer use.

We cannot yet report decisively as to the value in all respects of any of the varieties retained in the list. Among the kinds worthy of trial for late use, we may safely name, of the deep-eyed varieties of the Peach-Blow class, the following: Young's Pink-Eye, Duke of Cumberland, Prairie-Flower, Indiana Russet, Bermuda, Faucett, Alaska Long Pond, Eureka, Fox-Eye and Strawberry Bloom. Of the promising varieties of the smoother eyed class for late use, we may safely name for trial: Bread (not Brownell's Bread,) Galva, Andes, Iowa

Beauty, Prince Regent, Massachusetts, Wilson, Victor and San Francisco.

For early use we may specially commend for trial Grinnell's Seedling, Snowball, Extra Early York and Extra Early Vermont. A number of the much lauded new varieties producing profitable crops, apparently only on very rich soils and with the best of culture, are not here named, but they are retained in the list for further trial.

It may be proper to remark that the varieties of late keeping potatoes giving the best yield, and most vigorous in habit of growth on common soils, are about all of the deep-eyed class like Bermuda and Strawberry Bloom. The *Victor* is perhaps well at the head of the smoother varieties in all the essentials of a perfect variety for winter use, but its color is objectionable for market.

We now have growing a great number of seedlings whose parentage is favorable for desirable additions to our list for western culture. We hope to report on some of these favorably in due time.

The vegetable garden has, previous to this year, shown a balance in its favor. The Treasurer's report this year shows it in arrears, mainly on account of expensive manuring, and too much unprofitable experimentation with potatoes and other garden crops.

PROPAGATING HOUSE.

This is only referred to as a model of cheap construction enforced by the refusal of the Legislature to make an appropriation for a plant house; and the equally cheap system of heating enforced by the limited appropriation to the department from the interest fund, which has to be apportioned among the several divisions of the work.

By a peculiar and somewhat original arrangement of the hot water pipes, the small conical boiler—no larger than a sitting-room stove—which heats the grafting room, is made to heat, perfectly and uniformly, two glass-covered pits 34 and 44 feet in length and respectively 12 and 14 feet in width, and the heating is done with less coal than suffices for most prairie sitting-rooms.

The pits are used for the propagation of plants for the vegetable and flower garden, and for the manifold methods of propagation in the experimental division. It answers our practical wants moderately well, but it is somewhat annoying to hear the remarks of our many visitors relative to the character and style of what they persist in calling the College "green-house."

FORESTRY.

No additions are, for the present, being made to the forestry plats. In the class-room special attention is given to theoretical and practical forestry, and the work is encouraged in the State by an extended correspondence, the dissemination of forestry seedlings, and by the wide diffusion of copies of the Forestry Annual of the State Horticultural Society.

No attempt has been made to establish an arboretum creditable to the College and the State. A full collection of the trees and ligneous plants of the northern portions of the two continents would soon become an object of interest, and an enduring credit to the State. The utility of such a collection for experimental purposes, and for the use of students, is too evident for discussion. In other northern states liberal appropriations have been made by their legislatures for aiding work of this kind. So far in our State entomology and experimental horticulture and agriculture have struggled along without such aid.

HORTICULTURAL CLASS.

A general idea of the work done in the class-room may be gathered from the course of study and practice outlined in appendix of this report. Class instruction in theoretical and practical horticulture now commences with the second term of the freshman year and closes with the first term of the junior year. Consecutive lessons, continued through three full terms, in combination with propagating house, and field practice and observation, and a full course in the closely related natural sciences, cannot fail in the near future to give to the State many intelligent young votaries of Pomona, who will make their mark in the development of systematic, methodic gardening.

WANTS AND NEEDS.

I should not do justice to myself or the State if I failed to make a few remarks under this head. A feeling has grown up in the State that the Agricultural College is rich in lands and endowment fund, and that the Legislature should persistently refuse it all aid for experimental horticulture, agriculture, or buildings. It is true that the interest fund, so far, has supported the numerous academical and technical departments in a manner about meeting the requirements of the endowment act and State law. The annual appropriation of one

thousand dollars from the interest fund will quite respectably sustain horticulture and forestry in its legitimate work as a school department, but after paying the salary of foreman, for fuel for class-room and propagating house, for continually recurring wants in the way of fixtures, tools, etc., and fifteen cents per hour for team, and ten cents per hour for unskilled and detached student labor, but a trifle is left for the expenses of any of the non-paying lines of work most useful to the State at large.

If we had an appropriation from the State of about one thousand dollars annually for aiding this vitally important line of experimentation, in a very brief time a less number of visitors would express wonder at our want of an arboretum, of botanical gardens, of model experimental plats, etc.

Special aid of the Board of Trustees, with some aid from the State Horticultural Society, combined with pecuniary aid and double duty on the part of the writer, have permitted a fair showing in this report of experimental work that will be valuable to the State. But this showing in this special line has been at the expense of other divisions of our work which should not, and cannot, continually bear neglect. After careful consideration of the matter I can see no way open for the respectable maintenance of an experimental station that will annually grow in importance and usefulness to the State at large only by securing a small annual appropriation from the State Treasury.

REPORT OF THE DEPARTMENT OF DOMESTIC ECONOMY.

To The Honorable Board of Trustees:

I BEG leave to make the following brief report of the present condition and future needs of the Department of Domestic Economy.

The course, both in the sophomore and junior years, was entered upon eagerly and pursued enthusiastically. Through the months of March and April the sophomore young ladies received careful instruction in washing and ironing. Each pupil did all her own laundry work and one shirt weekly in addition. Several had never done any work of the kind before and needed the closest supervision for the first two or three weeks. Unusual progress was made and most excellent work done, notwithstanding we were so cramped for room as to labor under serious difficulty all the time. The only way in which it was possible to manage the class was to divide it into two divisions, arranging for one-half to wash and the other to iron at the same time. It would have been quite impossible to have attended to these properly, since they must necessarily work in different rooms, had it not been for the very efficient help of Mrs. Thompson, and I wish to acknowledge here the obligations of the department to her. We were compelled to use hard water altogether, and though a useful lesson was learned as to its proper management, we should have had rain water also to have made the instruction complete. The narrowness of our quarters was, however, our most serious trouble. Six girls washing, five ironing, and two teachers in the small rooms assigned to us, left hardly space to turn. We could not find place for tables enough to give the ironers room to do their work easily and well, and for the five or six washers there was room for but four tubs. And when May had come, and it was time for the lessons in sewing and dress-making, we were obliged to abandon our own rooms altogether, since one of them is so poorly lighted it could not be used for sewing, and the other was so small that the class could not be seated in it by any arrangement whatever. After some difficulty and a good deal of anxiety on the part of the President and the teacher of Domestic Economy, we finally went into the room used by the Crescent Society, where we finished

the term's work. The teaching of washing, ironing and sewing was so entirely an experiment that many things were learned by the teacher as well as by the pupils, and she will enter upon the next year's work confident of her ability to improve and enlarge the instruction given. It is not too much to say that the class at least were satisfied that their time had been profitably employed.

The junior class commenced work in the kitchen about the first of August. They finished a course of twelve lessons, occupying their Saturday mornings through August, September and October. For the first time a text-book was used, the lessons being mainly taken from Miss Juliet Corson's "Cooking School Text-Book." There were seven in this class, and the same difficulty as to sufficient room hampered us still. I cannot contemplate the possibility of the department being so cramped in the future without serious foreboding. It is impossible it should be generously developed within its present narrow limits. The course even for the next year must be considerably abridged if given in the same rooms, and as the classes enlarge and the institution grows, year by year, less attention will necessarily be given to each pupil, since the classes must be more and more cut up into divisions and sub-divisions.

There are several problems for the Board to solve in connection with this Department. The expense of carrying it on will undoubtedly increase unless some wise expedient be decided upon to lessen it. I can not see why the experimenters in the kitchen and laundry should not pay a small fee as well as the experimenters in the chemical laboratory. The girls who do their own washing and ironing derive an actual pecuniary benefit from their lessons, since they are furnished soap, starch, etc., free of cost, and at the same time are not obliged to hire any washing done.

Upon consultation with Mrs. Thomson and with the approval of General Geddes and the President, I respectfully submit to the Board the following plan for lessening the expense and increasing the value of the work of the classes in Domestic Economy.

For practice in the laundry, each student shall do her own washing and ironing and in addition thereto shall do up one shirt and shirt-collar weekly. The expense of soap, starch, blueing, cleansing material and fuel, shall be accurately determined and divided equally among the class. This will relieve the College from all expense, except the cost of instruction, so far as the laundry work of the Sophomore Class is concerned.

The course for the class in sewing shall be as strictly progressive as possible. For the drill in hemming, over-and-over sewing, and back-stitching, the Boarding Department shall furnish the sheets and pillow-cases which have to be made every year, to such pupils as have not suitable work of their own. The darning, mending, and similar work, may be furnished either by the teacher or by each pupil for herself. Every young lady in the class shall be required to cut, fit and make at least one dress, under the careful instruction of a competent dress-maker. The material for this may be furnished by the student, or in case she does not wish to make herself a dress, can be furnished by the teacher. After sufficient progress in sewing by hand has been made, instruction on the sewing-machine shall be given.

The course in Cookery shall be so arranged that for the most part the products resulting from the work of the class can be consumed in the College dining-hall. The Steward agrees to furnish materials free of expense to the department, providing they can be cooked and returned to the dining-room in time for the regular meals. By a little forethought, and by means of systematic consultation with the house-keeper, it is believed that all such things as meats, vegetables, soups, pies, plain puddings, biscuits, bread, cake and like dishes, can be cooked by the class in sufficient quantity to be of service in the dining-room. This will of course involve such a fitting up of the new building as will give the proper facilities for cooking on so large a scale, but after the first expense is met, the cost of carrying on the class will be materially lessened and the benefit to the student as greatly increased. It will make the entire course strictly practical and admit of its development in such a way as to give the Freshman Class the benefit of its advantages, thus adding another year to the time allotted to the study of domestic economy. This plan cannot of course be carried into execution until enlarged quarters be assigned to the department, but even for the next year and in the old rooms some of its features can be adopted.

I have before me a circular of the Raleigh Cooking School in which two dollars an hour is charged for instruction beside the cost of material. Miss Corson gets one hundred dollars for six lessons, all her expenses, and all material furnished. I simply mention these facts to show the rank such instruction holds at present. Competent teachers are few in number and the demand is increasing rapidly. I have thought, if enlarged quarters and facilities be granted the department, its usefulness might be increased and a small sum accrue by opening a

Saturday afternoon class to all who desired to attend, and charging a small fee for tuition. I believe such a class might be made successful.

I am sure facts will bear out the assertion that no department of the College has for the last two years attracted more general attention, or added more to its popularity than the Department of Domestic Economy. I have had, within a few months, letters of inquiry from New York, North and South Carolina, Missouri, Indiana, Massachusetts and District of Columbia, each expressing great interest in my work, and asking numerous questions concerning it. Many papers, including the *New York Tribune* and *Independent*, the *Chicago Inter-Ocean* and *Journal*, the *Detroit Free Press*, the *Youths' Companion* and journals of like character, to say nothing of those of our own State, which have without exception approved the department, have spoken highly of the wise forethought of the Board of Trustees in establishing and fostering such an enterprise. The Bureau of Education at Washington has just published a pamphlet for general distribution on the subject of Domestic Economy in schools, which gives a full account of the department here. I call the attention of the Board to the fact that there are but five or six schools of cookery in the United States, and except our own not one school in which both laundry work and sewing are taught. All these flattering indications surely mean that usefulness to our commonwealth and credit to our College will certainly attend the full development of this department.

There are many things to be seriously studied into if a new building and better appliances are indeed secured. We ought to make sure that no mistakes shall occur either in the arrangement or fitting up of such a building. The newest and best methods of laundry work, the most advanced processes in cooking, the cheapest, most durable and best utensils, the wisest methods of instruction—all these should be clearly understood. And they can be studied nowhere except in some large city where each has been brought to its utmost perfection. We must remember that though we have done a great deal, we have worked without precedent, and if now we can add to the knowledge gained by actual experiment that which greater years of similar work has garnered, we shall be able to stand comparison with any such school, no matter where situated. The New York Cooking School was the first opened, and has been the most successful and best known of any such school in America. To visit this and similar schools, to spend a little time in some of the best laundries, to look up the question of cheap

and good utensils, to study the most extensive markets, to become familiar with the most economical and skillful processes of cutting up and preparing meats, is my extreme desire. I believe it will be returned many-fold to the department, even in the course of the next few years, and I am confident that the Board can in no way further its interests better than by making an appropriation sufficiently large to justify the expense.

EXPERIMENTAL WORK IN THE CHEMICAL LABORATORY
FOR 1878 AND 1879.

DURING the last two years careful analyses have been made of the most common wild and tame grasses, in order to determine their relative values for hay. In this work I have been obliged to rely mainly on Mr. W. K. Robbins, a graduate of 1878. The grasses were collected by him, and the determinations of proteine and moisture are his work; the other determinations were made by myself. These analyses are, I believe, the only ones that have been made, and are a sample of what our students can do. The following, with a few additions to the tables, are taken from Mr. Robbins' articles in the *College Quarterly* for July and September, 1879:

TABLE OF GRASSES CUT IN 1878.

	Fats.	CARBO-HYDRATES.		Ash.	Proteine.	Moisture.
		Cellulose.	Starch, etc.			
Andropogon.....	6.39	25.29	42.85	7.27	8.03	10.17
Sporobolus.....	5.17	28.30	42.68	6.60	7.82	9.43
Timothy.....	2.95	34.55	49.80	5.04	7.86	9.80
Spartina.....	7.14	31.75	37.58	3.67	7.80	12.06
Sedge.....	5.27	24.09	44.79	7.87	7.99	9.99
Red Top.....	4.54	30.34	43.55	7.83	5.78	9.04
Blue Grass.....	3.35	28.84	46.61	7.24	5.14	8.83
Muhlenbergia.....	5.19	27.93	41.87	8.50	6.53	9.98

The tame grasses, timothy, red top, and blue grass, were cut just after the period of blooming, the wild grasses the last of July, the sedge the last of August.

TABLE OF GRASSES CUT IN 1879.

	Collected.	Fats.	Proteine.	CARBO-HYDRATES.		Ash.	Moisture.
				Cellulose.	Starch, etc.		
Timothy.....	May 12	6.37	17.95	17.76	43.94	10.65	9.33
Timothy.....	June 16	6.32	11.26	24.75	41.32	5.65	10.70
Timothy.....	July 22	4.53	7.21	29.92	43.54	4.49	10.31
Red Top.....	May 12	8.05	15.25	19.48	35.45	11.09	10.18
Red Top.....	June 16	4.66	7.63	26.01	42.27	8.98	10.45
Red Top.....	July 22	4.35	7.25	29.68	37.52	10.65	10.55
Blue Grass.....	May 12	9.22	15.88	22.90	34.04	8.52	9.44
Blue Grass.....	June 16	3.35	5.14	28.84	46.60	7.24	8.83
Andropogon.....	May 12	8.61	14.67	22.16	37.53	8.04	8.99
Andropogon.....	June 30	6.09	9.44	25.32	43.14	6.06	9.95
Andropogon.....	July 22	6.44	7.64	26.04	42.53	7.09	10.26
Andropogon.....	Aug. 16	7.39	6.61	32.08	40.64	4.44	8.84
Andropogon.....	Sept. 9	6.03	7.24	34.25	38.36	6.00	8.12
Spartina.....	May 12	6.27	17.19	28.02	35.47	6.96	6.09
Spartina.....	June 16	5.94	10.48	29.80	40.06	4.53	9.19
Spartina.....	July 22	5.41	9.43	30.28	40.17	4.96	9.75
Spartina.....	Aug. 16	5.25	6.97	29.92	44.56	4.27	9.03
Spartina.....	Sept. 9	5.00	7.12	29.83	45.33	5.53	7.19
Muhlenbergia.....	May 12	6.48	17.84	25.74	31.21	8.59	10.14
Muhlenbergia.....	June 16	6.14	11.33	29.74	35.66	6.84	10.29
Muhlenbergia.....	July 22	5.33	7.69	28.58	35.66	13.15	9.59
Muhlenbergia.....	Aug. 16	4.95	7.69	31.85	38.08	8.56	8.87
Sherobolus.....	Sept. 9	4.70	7.73	32.38	38.52	8.65	8.02

The *Andropogon*, of various species, is known to most farmers by the name of "blue stem," or "blue joint," and grows on low ground, which, however, is generally rich and tillable. The genus *Spartina* furnishes most of the species which make what is known by the common name of large, coarse, "slough grass," which grows on quite low, moist ground. The grass that grows around ponds and in quite wet places, with a round, hard stem and a bushy top, sometimes called "small willow-top," of the genus *Muhlenbergia*, is placed last, but is about equal to blue grass in value.

The compound of most value in the table is the *proteine*, as it contains nitrogen in combination, and is the source of flesh and power. The fat and carbo-hydrates are of the next importance, as they furnish respiration material. The *cellulose*, or woody fibre, is, part of it, converted into sugar in the process of digestion, but this part decreases as the percentage which the plant contains increases. Hence, a small

per cent of it is desirable. The moisture and ash are little to be taken into account only as they influence the percentage of other compounds.

The table shows in a strong light the fact that as a grass grows older it becomes lessened in value as food for sustaining the body; thus the nitrogenous substances to which we have given the general name of *Proteine* decrease very rapidly, there being only one (*Spartina*) which has not decreased over one-half in the amount of this compound from May 12 to July 22, and several have lost almost two-thirds in the same time: now, this, as before stated, is the most important compound in the composition of a food, and when this falls off at the rate of three per cent per day (as in the case of timothy) it amounts to something worthy of serious consideration. But this is not the only way in which grass suffers a loss of value by age.

As the plant grows older the cell walls become thickened by a deposition of cellulose, which makes the food less palatable, and besides it exerts an unfavorable influence upon digestion. In the first place, the greater the amount of it contained in a food the less of it will be digested; and in the second, it decreases the digestibility of fats, soluble carbo-hydrates (starch, etc.), and *proteine*, often causing the latter to vary in digestibility from seventy to as low as thirty-nine per cent of the amount which the plant contains: hence, a food containing half as much *proteine* as another, would not be worth half as much, supposing the other to have exactly the same amount of cellulose, which, however, is not the case, for as the percentage of *proteine* decreases that of cellulose increases, as will be noticed by referring to the above table. The starch, etc., is seen to increase with age, but as this is accompanied with an increase of cellulose which decreases its digestibility the amount of it available to the animal will not be as great.

The fats also are shown by the table to decrease; and as the percentage of them digested is lowered by the increase in cellulose, they show still another decrease in the value of hay.

We can thus see that as the period of growth advances, all those compounds which are of value to the animal rapidly decrease, while the one which we should seek most to avoid increases in a like manner, and hence the proper time to cut hay becomes a question of no small importance to the farmer who wishes to receive the highest reward for his labor; the relative values of different hays varies at different times, and the one that is superior at one season of the year is inferior at another. Thus placing the richest first, the order for May 12

would be Timothy, *Mulenbergia*, Red Top, *Andropogon*, *Spartina*; and for June 16 it would be Timothy, *Muhlenbergia*, *Andropogon*, *Spartina*, Red Top; and for July 22, *Andropogon*, *Spartina*, *Muhlenbergia*, Red Top, Timothy.

It will be observed that the tame grasses lose in value more rapidly than the wild—for the reason perhaps that they attain their full growth much sooner, so the matter of delay in cutting tame hay is attended with greater loss than with the wild. Next year I hope to determine the relative value of the wild and tame grasses for grazing. The tables above show their comparative value for hay, only one cutting being made from the same spot during the year.

POPULAR CONTRIBUTIONS FROM THE BOTANICAL LABORATORY.

BY C. E. BESSEY, PROFESSOR OF BOTANY.

THE LIVING PARTS OF A PLANT.

AN examination of the living tissues of a plant by means of a high power of the microscope, shows that they contain a considerable quantity of a substance which is identical with that found in living animals. Comparing a piece of a dead plant with a living one, this substance just referred to is found wanting, or if present, it is shriveled up or disorganized. This substance is the *Protoplasm* of the scientific world; it might have been called with equal propriety and greater plainness "life substance," for it is capable of demonstration that it is always present in living parts, and always absent from or partially destroyed in dead parts. Furthermore, if we place under the microscope a small living plant (and it is most convenient to take one of the simpler microscopic ones) it can easily be seen that anything which seriously injures the *protoplasm* destroys the life of the plant; thus if a drop of iodine be applied, the *protoplasm* shrivels up, and from that instant life ceases.

Every part of all annual plants commonly grown by the farmer contains this life substance, and is consequently alive: but the case is different with the trees and shrubs which come so largely under the care of the horticulturist. In an apple tree, for example, the microscope shows that there is no *protoplasm* in the heart-wood of the trunk and branches, and that even in the sap-wood none can be found except near to the bark. Examining the bark no *protoplasm* is found except in the inner layers. If now the thin layer between bark and sap-wood be examined at any time of the year an abundance of *protoplasm* is found. This intermediate layer (the Cambium layer of the

botanists) shades off on either hand into layers which have less and less—and finally no *protoplasm*. We may express it another way, and say that the layer of life shades off on either hand into death. In the summer the Cambium layer is in direct communication with every leaf, and it is prolonged downward through all the living roots to their young and active tips. Thus there is a continuous living tissue from one extremity of the tree to the other, from the absorbing organ, the root—deep in the ground—to the assimilating organ, the leaf—high in the air.

If by any means the continuity of the living tissues of a plant is broken, as a rule, the separated part must die. This is the reason why branches and twigs die if girdled by a knife or insect, or by any other means, and the only apparent exception to this rule is when a girdled branch by growth renews the communication; this, however, rightly considered is in reality no exception to the rule given. So too in the operations of grafting and budding the continuity of the living tissue is broken for a time, but by the growth of scion and stock the continuity is again made perfect. It scarcely need be said that upon the speedy closure of the break in the continuity of the living layer depends the life of the scion.

Trees girdled by mice sometimes live for some time, and in some cases recover: in the latter case it is invariably due to the fact that the living tissues above and below the injury have joined again into a continuous whole: in every other case the separated part *must die*, sooner or later, and the catastrophe is only deferred by the amount of available plant-food it contains, and its ability to make use of it. It is said that away at the summit of a girdled giant red-wood, in California, the branches continued growing, and the leaves remained green for many years after the lower part of the trunk was dead and dry.

COMPARATIVE HISTOLOGY OF LEAVES.

The introduction of the great number of varieties of apples and pears from Russia and Eastern Asia, made by Professor Budd, have made it possible to make microscopical examinations of the leaves. These have not as yet been sufficiently numerous to permit of a full report being made, but this much can already be said, that there appear to be marked differences in the details of microscopical structure between the leaves of the hardier and those of the tenderer varieties. The epidermis of the hardy varieties appears to be thicker,

and in a cross section of the leaf the "palisade cells" are more numerous. The subject is a most interesting one, and it is hoped that, as the opportunity for making an extended series of systematic examinations is now a most favorable one, sufficient time for the purpose may be found during the next few years.

WHITE, OR ALBINO LEAVES.

Every one, perhaps, has noticed here and there in a field of Indian corn, a stalk whose stem and leaves were perfectly white, and doubtless many guesses have been made as to the curious cause of the phenomenon. Under the microscope such white plants are found not to be structurally different from normal plants, with but one exception. The protoplasm is disposed in the usual way, and the cells themselves have about the same size and shape. There is this difference, however: the little masses of protoplasm which in normal plants are saturated with the green pigment, Chlorophyll, are in the albinos, entirely destitute of this substance. Now, it has been shown by carefully conducted experiments made by Sachs (*Experimental Physiologie*) that in the absence of iron from the food of plants, their leaves and all other organs are white. It is, therefore, likely that albinism is in some way due to a deficiency in the supply of iron to the young plant. The most probable solution of the question is that those grains of corn which produce albinos are themselves wanting in a sufficient quantity of iron to enable the young plant to manufacture chlorophyll.

A pure white plant is necessarily short-lived, for the green matter (chlorophyll) is a kind of digestive substance, in a rough way comparable to the digestive fluids of animals, and in its absence, the plant being unable to digest, soon perishes from starvation. During all the time that a *perfectly white* plant is growing, it receives its nourishment from the seed, and when that store is exhausted, it must die. True the roots may get water; in that water there will be potash, lime, phosphorus, and other substances, and these may be added to the plant in small quantities, but of the substances which enter into the composition of the plant, nothing can be added more than is found in the seed. In some respects these white plants remind us of many parasites and saprophytes (*i. e.*, plants which live on dead organic matter); the Indian-Pipe and Beech-Drops and all the fungi are wanting in this coloring matter, and like the albinos, they are incapable of using carbon dioxide (carbonic acid) as food.

THE DIAMETER OF WOOD-CELLS OF PLANTS.

Much has been said about the hardness of a plant depending upon the size of its cells, it being supposed by some that the cells of hardy plants are considerably smaller than those of tender ones. Without entering upon a discussion of this subject at this time, it may be well to give the results of some careful microscopical measurement made in the Laboratory. The measurements were confined to the mature wood-cells, and will serve only to give a general notion of the relative size of the cells of the living parts (Cambium). Wood-cells develop from Cambium-cells, and the change in the diameter in the process is very little in the tangential direction, so that the measurements given will apply with an exceedingly small error to this dimension of the Cambium cells. The measurements are given in decimals of a millimeter:

	TANGENTIAL DIAMETER.	RADIAL DIAMETER.
Silver Maple.....	.0125	.0125
Iron-wood.....	.0160	.0160
Hackberry.....	.0100	.0100
White Willow.....	.0114	.0114
Basswood.....	.0150	.0150
Virginia Creeper.....	.0200	.0100
Wild Grape.....	.0118	.0118
Apple (European specimen).....	.0125	.0125
Pear (European specimen).....	.0125	.0125
Pear (European specimen).....	.0250	.0250
Tulip tree, or Yellow Poplar, of Ohio.....	.0125	.0200
Chrysanthemum (old woody stem).....	.0125	.0200
White Pine (cells formed early in the season).....	.0500	.0275
White Pine (cells formed late in the season).....	.0200	.0125
Arbor Vitæ (cells formed early in the season).....	.0200	.0225
Arbor Vitæ (cells formed late in the season).....	.0200	.0125

THE SUPPOSED CIRCULATION OF SAP.

Vegetable physiologists are now pretty generally agreed that there is, properly speaking, no such thing as a circulation of the sap in a plant. The facts as to this question appear to be as follows, for ordinary plants, such as the common herbs, shrubs and trees:

1. Water enters the plant through the roots and escapes from it through the leaves. Its entrance is due to the power of imbibition possessed by the life substance (protoplasm) in the roots. Its escape is due *solely* to evaporation. Now, when evaporation takes place, there must be an upward movement of the water, but this movement is like the upward movement of the water in a suspended towel, one end of which is in a basin of water, and in either case the more rapid the

evaporation is, the more rapid the upward movement. Furthermore, when evaporation ceases, as in a damp atmosphere, then in either case, again, the upward movement of water ceases.

2. This water, while in the plant, is continuous from side to side, and extremity to extremity. One of the most common errors is the opinion that in some way the water in the plant is partitioned off into small tracts and spaces. The fact is that every living part of a plant is freely permeable to water, and it can pass from cell to cell, and tissue to tissue, as easily as the water in a fish-pond passes through the coarse meshes of the nets suspended in it. Even in the apparently solid parts of plants, as the new wood of the stems, the water passes freely through the walls, and it is only in the old, dead, and lignified parts where any considerable resistence is offered to its passage.

3. There are many soluble substances in the cells of different parts of plants, consequently as the water passes through one cell it holds in solution for the time being, its soluble matters, but as it passes out it may, or it may not carry along these substances. To return to the fish-pond comparison again, while the water may pass freely through the nets, not all of the fishes can do so, or, in other words, that which offers no obstruction to the water prevents the passage of certain of the fishes (the larger ones). So it is with the cell-walls, while the water may pass freely some of the substances are prevented from passing through. Thus in the petals of many flowers contiguous cells may have on the one hand a red, and on the other a yellow coloring matter, both soluble, but both incapable of passing through the single cell-wall which separates them, while the water in which they are dissolved passes freely. On the other hand, some substances appear to pass through cell-walls as easily as the minnows pass through the nets in the fish-pond.

4. The soluble substances of the second class (*i. e.* those which pass freely through the cell-walls) are lime, potash, and other minerals, together with such organic compounds as sugar, inuline, etc., the latter made from carbon dioxide and water in the leaves. Now if we inquire attentively as to the movements of these substances we find that not only do they move freely through living cell-walls, but that they move always towards the place or places where they are being used in the growth of tissues. Thus in the formation of the cell-walls (pure wood) sugar is used up, consequently there will be a movement of the sugar in surrounding tissues towards the place where the sugar is used. But there will be but a very little movement of the water

toward this point, for in this stage water is not and cannot be transformed into cell-wall material.

5. The movement of sugar, inuline, lime, etc., is due to the force of diffusion, these substances diffusing themselves through the water without any necessary movement on its part. In point of fact sugar diffuses mostly downwards (because it is made in the leaves), and lime, potash, etc., upwards (because obtained by the roots), in the same water.

6. There is no mechanism for a downward flow of the water in the plant. The only arrangement for any movement of the water is that already described, in which the movement is entirely upward because of evaporation from the leaves.

7. The common saying that the sap goes down into the roots in the fall is entirely erroneous. On the contrary there is rather more water in tissues of the stem and branches in the winter than in the corresponding ones in the spring and summer.

THE SUPPOSED ELONGATION OF THE TRUNKS OF TREES.

It is a well known fact that the joints (internodes) of very young stems and twigs elongate for a few days (or perhaps for a few weeks in extreme cases), after growing from the bud. This seems to have given rise to the opinion that stems always elongate, and probably this was strengthened by some hastily made observations. While vegetable physiologists have long known such supposed after elongation to be impossible, it was deemed best to settle the matter in a manner which could be understood by all.

On May 3, 1875, six trees were selected and treated as follows:

1. A young Silver Maple, whose trunk had a diameter of three inches. Three tacks were driven into its trunk a foot apart; then after applying an accurate twelve inch boxwood rule, a knife was drawn across the head of each tack making fine marks which were thus exactly one foot apart.

2. A young Silver Maple, whose trunk had a diameter of two inches. Into this two tacks were driven, and the fine marks were made as in the previous case.

3. A Norway Spruce, about six feet high. Into the terminal shoot two tacks were driven so that the twelve inch rule could just be slipped between them, the uppermost tack being about two inches from the end of the shoot.

4. A Siberian Crab tree, whose trunk had a diameter of about one and three-fourths inches. Two tacks were driven into the trunk and fine marks were made upon them as in Number One.

5. A young Norway Spruce. Into the part of the stem which grew as the terminal shoot in 1873 (consequently at the time of the experiment two years old) two tacks were driven, and the ruler placed upon the lower one, and a fine mark made upon the upper one.

6. A Siberian Crab tree with a diameter of trunk of about one and one-half inches. Two tacks were driven into the trunk and fine marks were made as in Number One.

At the close of the growing season (October 1, 1875), all the trees were carefully examined, with the exception of Number 2, which had been destroyed in a gale. The utmost care was taken in comparing the measurements of the spring with those of the fall, and in no case was there any difference whatever. Even in Number 3, where, if anywhere, an elongation might have been expected, there was not any difference between the two measurements.

BOTANICAL ASPECT OF APPLE BLIGHT.

Microscopical examination of blighted twigs give the following results:

1. On the dead and dry leaves a fungus of the genus *Macrosporium* is found. This, however, is a common attendant upon decaying parts of plants, and is not a parasite, hence it is to be regarded as an accompaniment and not a cause of the blight.

2. The brown discoloration appears to travel up the petiole into the leaf. The blade of the leaf is apparently not the seat of the disorder.

3. In a cross-section of the green portion of a partially browned leaf nothing peculiar or abnormal can be detected.

4. In a similar section of the brown portion of a partially brown leaf the protoplasm is brown and contracted, but in this there is nothing peculiar; in the ordinary death of a leaf (before the time for its fall in autumn) the protoplasm has the same appearance.

5. Fungus threads (hyphæ or mycelium) are not found in the leaf tissues of either the green (living) or the brown (dead) portions.

6. At the base of the current season's growth at the point where the new growth joins the growth of the previous year the pith is (in many instances at least) found to be dead, brown and dried up.

Now it is easily shown that many twigs are injured just enough during the winter to kill the pith for from a quarter to half an inch below the terminal bud, while the bud itself is not killed. This took place in the winter of 1878-9 very abundantly, and many such injured twigs grew without blighting during the season of 1879, while many others blighted badly.

These facts point to this explanation: Injured twigs may shoot up and grow, even though the pith is killed, provided that the season is a favorable one, or that in some way the tree is favorably situated, so that the new twigs receive water enough to make good the loss by evaporation. If, on the other hand, the season is a dry one, or if dry, hot days alternate with damp ones, not enough water can reach the twigs to supply the great loss by evaporation; the interval of dead pith very greatly narrows the channel for the supply of water, and when the evaporation is excessive, the death of the twig must ensue.

THE RATIO OF POLLEN-GRAINS TO PISTILS IN INDIAN CORN.

A pollen-grain of the Indian corn is about .004 inch in diameter, which would allow 14,000,000 to be packed without crushing in a cubic inch. An anther of Indian corn has, as determined by approximate measurements a capacity of about .00025 cubic inch, therefore if packed full (which it never is), it might contain 3,500 pollen grains.

Two fresh anthers were emptied out upon separate slides and spread out as evenly as possible, and then by counting the number of pollen-grains upon several areas under the microscope and then making the proper calculation, the number for one anther was estimated at 1,500 and for the other, 3,000. Allowing for errors in calculation the average number of pollen-grains was assumed to be for each anther about 2,500. By careful counting, the number of stamens in an average sized tassel was found to be 7,200. This multiplied by 2,500, the number of pollen-grains in each anther gives the whole number of pollen-grains in a tassel as 18,000,000.

In a medium sized ear of corn there are seven hundred and twenty grains, or in other words there were so many pistils in the young ear. Allowing, however, 1,000 pistils to each young ear and two ears to each stalk, the pollen-grains are to the pistils as 9,000 to 1; in other words, for every pistil of Indian corn to be fertilized, there are provided 9,000 pollen-grains.

OBSERVATIONS ON THE GROWTH OF TREES.

On the fourteenth of May, 1875, two Silver Maples, which were just beginning their season's growth, were selected.

No. 1 was about twenty feet high and its trunk had a diameter of about five inches.

No. 2 was about seventeen feet high, and the diameter of its trunk was between three and four inches.

On the first day of October, my assistant, Mr. Snell, made, under my direction, a series of careful measurements of the twigs which had grown the current year. It was found from those that upon tree No. 1, two hundred and eleven new shoots, averaging 16.79 inches in length were formed, making a total length of twig extension of 295.22 feet.

In tree No. 2, one hundred and forty-five new shoots, averaging 17.77 inches in length were formed, making a total length of twig extension, in this case, of 214.72 feet.

Supposing the growth to have been uniform throughout the season of one hundred and forty days, this would be at the rate of a little more than twenty-five inches a day in tree No. 1, and a little more than eighteen inches a day in tree No. 2. As, however, the growth in length takes place in from one-half to three-fifths of the season, the actual daily growth of twigs must have aggregated from forty-two to fifty inches in No. 1, and from thirty to thirty-six inches in No. 2.

Measurements were made the same year, of four spruces, and in these the aggregate twig growth of the two preceding years was also carefully estimated. The results are given in the appended table.

	Twig growth of the years.	Number of twigs.	Average length of twigs, inches.	Total growth, feet.	Length of terminal shoot, inch's.
No. 1. Norway Spruce, eight feet high	1875	645	4.9	263.0	14
	1874	450	5.1	191.0	20
	1873	315	3.1	81.7	13
No. 2. Norway Spruce, ten feet high	1875	1,065	4.2	372.6	18
	1874	625	3.4	176.8	10
	1873	450	4.4	165.0	18
No. 3. Black Spruce, seven feet high	1875	902	3.5	263.0	11
	1874	656	3.4	185.8	6
	1873	450	4.1	153.7	10
No. 4. Black Spruce, six feet high	1875	875	3.1	226.0	6
	1874	635	3.4	180.0	8
	1873	480	4.3	172.0	11

THE COLORS OF THE WILD FLOWERS OF IOWA.

If we exclude from consideration the grasses, sedges and other plants whose flowers are devoid of decided coloration, and also make no account of the rare plants, the colors of the remaining ones present the following interesting relations:

TABLE I.

Number and per cent of flowers of different colors.

COLOR.	NO. OF SPECIES.	PER CENT.
White	143	Equal to 37¼ per cent
Yellow	102	Equal to 26½ per cent
Red	27	Equal to 7 per cent
Purple	73	Equal to 19 per cent
Blue	39	Equal to 10¼ per cent

TABLE II.

Showing the colors of the above flowers by species, during the different months of the blooming season.

	WHITE.	YELLOW.	RED.	PURPLE.	BLUE.	TOTAL.
April	3	.....	.....	2	1	6
May	29	8	2	10	4	53
June	38	23	9	14	9	93
July	50	32	6	24	11	123
August	21	32	10	23	10	96
September	2	7	.....	.....	6	15

If the facts in the last table are presented in percentages the proportions of flowers of different colors will be more clearly brought out.

TABLE III.

Percentages of species of different colors, for the months of the blooming season.

	WHITE.	YELLOW	RED.	PURPLE.	BLUE.
April	50	.....	.....	33⅓	16⅔
May	54½	15	3¼	19	7½
June	40¾	24¼	9¾	15	9¾
July	40½	26	4¾	19½	9
August	22	33⅓	10⅓	24	10⅓
September	13⅓	46⅔	.....	.....	40

It is thus seen that the per cent of white species decreases from spring to fall, whereas the per cent of yellow flowers regularly increases. With the purple and blue species the percentages are highest in the spring and fall. In the preceding table (Table II) the actual number of species, in nearly every case, shows an increase to the middle of the season, and from thence a decrease; the greatest number of species of every color but red being in bloom in July.

If we add the white and yellow-colored species together on the one hand, and the red, purple and blue ones on the other, the first comprising the light colors and the second the dark ones, we have the following:

TABLE IV.

COLOR.	PER CENT.
Light colored species during the year.....	63 $\frac{3}{4}$ per cent
Dark colored species during the year.....	36 $\frac{1}{4}$ per cent

If we compare this with the results obtained by Buchan in the Flora of Great Britain, we find that the percentage of white species is greater in Iowa, while for the dark colored ones it is less.

COLOR.	PER CENT.
Light colored species in Great Britain	60 per cent
Dark colored species in Great Britain	40 per cent

THE CANADA THISTLE.

As this slander upon our good Canadian neighbors (for it is a native of Europe and *not* of Canada at all) is now an outlawed plant, every one should be able to recognize it, and distinguish it from the other thistles. The following description, in popular language, will enable any one to distinguish this troublesome weed without difficulty:

Plant usually low, generally about 20 inches in height, rarely 2 $\frac{1}{2}$ or 3 feet; very much branched, and spreading. *Leaves* many, rather narrow, and very prickly; green on the upper side, but generally downy on the under side. *Flower-heads* smaller than in any other one of our thistles, usually not more than a half-inch in diameter. *Roots* and *underground stems* numerous, the latter white and scaly, and creeping horizontally about 6 or 8 inches below the surface of the ground.

The two characters to be most taken into account are the *small size of the heads*, and the *creeping underground stems*.

If it be borne in mind that the plant spreads by the underground stems, and not the true roots, and that unlike ordinary thistles, this one is not a biennial but a perennial, those who have to deal with it will be able to do so more intelligently and successfully.

SOME VALUABLE WILD GRASSES.

It has doubtless often occurred to the observing man that some of our native grasses might be introduced into our meadows as forage plants. Our prairie soils and climate are so different from those of the Eastern States and Europe, from which all of our cultivated grasses have been derived, that it is no wonder our meadows are often not as good as they used to be in the East. There can be no doubt that the same principles as to soil, climate and other surroundings which hold among fruit trees, also hold among grasses. We no longer expect the best results from the growth of fruit trees which come to us from regions which differ greatly from the prairies in the surroundings indicated above.

Thus far we have in the prairies made use almost entirely of the introduced grasses from the Eastern States or Europe in laying down our meadow or grass lands. And it must be admitted that we have in many cases met with more of success than could have been anticipated under the circumstances. The success has, however, been by no means satisfactory, and there need be no excuse offered here for calling the attention of our prairie farmers to several wild grasses which are very promising.

The Drop-Seed Grasses. (*Muhlenbergia, sp.*) There are several kinds of wild grasses which are variously known as Small Willow Top, Limber Bill, Fine Slough Grass, etc., growing in moist places, and which appear to possess many, if not all, of the characteristics which a good hay grass should possess. These grasses are found on our prairies, growing around the edges of the sloughs. They do not grow *in* the sloughs, but always form a belt varying from a few feet to many rods in width, surrounding the wetter part of the slough. They do not naturally extend upon the highland.

There are several species of these grasses, but the one which appears to be the most important and perhaps valuable, is known to botanists

as *Muhlenbergia glomerata*. It has a fine stem which branches several times, and has a great number of leaves of moderate length. It blooms late, so that the "heads" are seldom seen; in fact it appears to be the general impression that it never produces flowers or seed. Late in the season, however, it produces a "head" somewhat like that of Timothy, but not so compact.

This is the chief grass in the best prairie hay, and those parts of the prairie which are known by our best hay-makers to produce the most valuable hay always have a very large percentage of this grass. Hence it may be concluded that there is some real foundation for the general opinion of its value, and that it would prove a valuable addition to the grasses of the farm.

Turning now to the grass itself it is seen to possess to a considerable extent the qualities which are desirable in a hay grass, viz—(1) its stem is not too large, (2) its leaves are abundant, (3) it forms a good sod, and so holds possession of the ground. Quite similar to the species described, is another also quite common in the same locality; this one is known as the *Muhlenbergia Mexicana*, and appears to be little if at all inferior to the preceding.

Examining the analyses of grasses made by W. K. Robbins (published in *The College Quarterly*, Vol. 2, No. 2,) it will be seen that the grasses under consideration rank very fairly from the chemical standpoint. The amount of *Proteine* (*i. e.* flesh-forming material) present was shown to be greater than in Red Top or Blue Grass, both of which are grasses of acknowledged value. The amount of starch was determined to be less in these wild grasses than that in our common cultivated species, but this is compensated by a considerably greater amount of fatty matter present in the former than in the latter. The results of the analyses are, on the whole, favorable to the wild grasses, for we find that when compared with the *best* of the cultivated ones they make a very good showing.

Another point: can these wild grasses be grown elsewhere than upon the low moist land bordering the sloughs? An affirmative answer cannot be given with certainty to this question, but many individual plants have been observed which have strayed upon the high land, and these were in all cases doing well. Doubtless under proper management they might be made to succeed upon ordinary high prairie, excepting of course the leachy hills which are lacking the necessary moisture.

The only objection yet suggested to these grasses is that it is not certain that they will endure pasturing, and the disappearance of prairie grasses when closely pastured is cited in evidence. If they have this fault it is a serious one, but it must be said that thus far the evidence is not conclusive.

A serious obstacle to bringing these grasses into cultivation will be the difficulty of getting the seed. At first it must be gathered by hand from the places where they grow wild, as no seed dealers in the world keep it. Necessarily the price will be high at first, and probably will always be so. This last will, however, not be an undesirable thing, as it will add one more to the profitable seeds for the farmer to grow for sale.

Blue Joint or *Blue Stem* (*Andropogon, sp.*). This large coarse grass appears at first sight to be of no value for feeding, and to the farmer who has but recently come to the prairie States it has naturally an unpromising look. The stems are coarse and reed-like, and the leaves are not very numerous, and a New England farmer would doubtless prefer to feed old straw to his cattle rather than this Blue Joint. And yet when he enjoys a closer acquaintance with this rank-growing grass he will respect it, and finally come to regard it as one of the valuable forage plants.

Botanically, Blue Joint is a near relative of Indian corn, Sugar cane and Broom corn, and it partakes much of their nature. In fact it may be compared to these, and in the comparison it does not suffer at all. Every one knows how valuable cornstalks are for feeding, and we know that, although the stems are thick and heavy, cattle manage to eat most of them if they were cut early enough to retain their nutritious qualities. Now then, Blue Joint possesses to a great extent the nutritive qualities of Indian corn, but has the additional advantage of having its stems much more slender, so that they can readily be eaten by cattle. The chemical analyses made in the Laboratory of the Agricultural College by Mr. W. K. Robbins bear out the assertion that Blue Joint is one of our most nutritious grasses, and the practice of some of our most observant and provident farmers fully confirms the results obtained by the chemist. There need be no hesitation in saying that we have here a wild grass which it would pay most excellently for our stock-growers to cultivate—not to the exclusion of Indian corn as a fodder, but in addition to, and as a partial substitute for it.

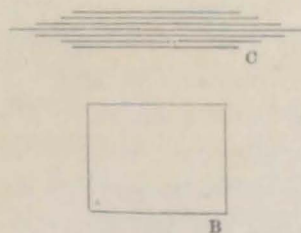
When it is remembered that it is a perennial, and that a field once seeded with it will last for many years, it at once becomes evident that to the stock-grower the escape from the necessity of annual planting and cultivating will prove a great saving of expense. It is hardly necessary to say that in order to make the best fodder from Blue Joint it must be cut before it goes to seed, otherwise the stems become hard and dry, and the leaves lose much of their juiciness.

CONTRIBUTION FROM PHYSICAL LABORATORY.

BY J. K. MACOMBER.

LIGHTNING RODS.

THERE are few topics on which the general public are less informed than that of lightning, and the best methods of protecting buildings from its effects. In its manifestations it is often terrific in character, so that the fears as well as the ignorance of the people are made use of by unscrupulous men for the purpose of swindling them. A brief note on the theory of electricity as applied to lightning will be given here, and then some of the erroneous methods of putting up lightning-conductors will be noticed. In all its manifestations electricity appears to have a double character. This fact is recognized by saying that there are two kinds of electricity. One is called positive and the other negative. Electricities of the same name repel; those of the opposite name attract. Under ordinary circumstances all bodies contain both of these electricities in the neutral or combined state. By certain mechanical and chemical means these electricities can be separated, and then they are said to be "free." For example, dry a piece of glass on a cold winter's day, and rub it with a silk or woolen cloth. It will then attract dry pieces of paper or sawdust. Sealing-wax is better than glass, and unless the air is very dry the experiment will not succeed. The glass takes one electricity and the cloth the other. During a thunder storm great quantities of free electricity accumulate in the



clouds. This electricity is generally positive. Let C in the figure represent a cloud charged with positive electricity. Let B represent a building on the earth beneath. The positive electricity of the cloud will attract the negative of the building and earth to the upper part of the building and will repel the positive away into the earth beneath.

Now, if the charge of the cloud becomes very great it will dart across the intervening air and meet the opposite electricity on top of the house. This is expressed by saying that the lightning "strikes." Physicists recognize two kinds of bodies, called good conductors and bad conductors. The last are also called insulators. It is a well known fact that a charge of electricity passes harmlessly over a good conductor, such as a metal; while it is likely to seriously injure an insulator, such as dry wood, glass or sealing-wax. With this brief outline of the action of electricity it will appear that there are two ways in which a good conductor may offer protection to a building. By putting a metallic rod, connected with the earth, on the building, a powerful discharge may be safely carried to the ground without damaging the wood-work or injuring the inmates. It is a well known fact that the electric current will always prefer a good conductor to a poor one. It will not touch the wood if a good metallic conductor is provided to carry it to earth. Again, it is well known that pointed objects will not long retain a charge of electricity. From the points it rapidly passes into the surrounding air. Hence, a metallic conductor fastened directly to a building, with its upper end pointed, will rapidly discharge the negative electricity from the upper portion, and thus lessen, somewhat, the attraction between the cloud and the building. If metallic bodies on a building be not connected immediately with the rod then there is no opportunity for their free electricity to pass off by the pointed rod. If the lightning "strikes" there is danger of lateral discharges from the rod to all metallic masses not connected therewith. An electric charge has been known to leave a lightning-rod and go through a twenty inch brick wall in order to strike a water-pipe inside a building. This occurred because the rod was poorly "grounded," and the pipe offered the best path to moist earth. Originally it was thought that by using glass insulators the lightning could be made to follow the rod directly to earth and not touch the building. But the insulators are useless for two reasons. In the first place, an inch or even a foot of glass would not prevent, in the slightest degree, the charge from passing from the rod to the house if the rod be not well connected with moist earth. It is absurd to suppose that after the electricity has passed through one-half or one-fourth a mile of air it is to be stopped by a few inches of glass! Again, after once being wetted the glass becomes a conductor. Until being wetted it prevents the free electricity of the house from passing to the rod and thence escaping into the air. Hence, the glass insulators are useless, to say the

least. Lightning-rod men still use them, either because they have not yet found out that they have long been discarded by scientific men, or because they figure in the long list of items on which erroneous profits can be made.

THE CHAMBER'S LIGHTNING-ROD.

This is a novelty in the way of a lightning-rod in that it is not connected with the earth and is mounted upon large umbrella shaped glass insulators. It is placed upon the ridge of the building and is pointed and turns upward at both ends. The inventor seems to think that by using insulators about ten inches long, the lightning can be prevented from striking the house and made to "diffuse back into the air." From the theory just given of the action of electricity, it will be evident to all candid minds that such an arrangement is lacking in all the essential elements of a lightning protector. This rod is actually being used in Iowa and many of the United States, and therefore a serious consideration of its deficiencies will not be out of place. The Chamber's rod is owned by a corporation which manages to get recommendations from prominent unscientific persons by means of ingeniously contrived experiments, and then the rod is sold on the strength of these testimonials. It is creditable to the scientific men of the country that no man having a reputation to lose has given it any support. The "*experiments*" by which so many are induced to testify to their belief in the rod, consist in an ingenious use of the balls and points. In the first place the experimenter uses a frictional electrical machine without condensers. Hence the spark used is so weak that it is no illustration of the actual state of things. Again, the instrument used in the experiments to illustrate the Chamber's rod, is so large compared with the electrified conductor, which represents the cloud, that it is no illustration at all. But in order to show the utter worthlessness of such a rod, the following experiment was devised:

A small wooden *thunder house*, about three inches long and three inches high, was provided with a rod on the plan of the Chamber's. Ebonite insulators were used. In the end of the house were a number of holes into which a brass plug with a knob on the end could be stuck. This knob, by means of a chain, was connected with a metal plate on which the house stood. The distance from the lightning rod on the house to the brass plug, could be made from one-half an inch to two inches, with nothing but dry wood between. The negative pole of a powerful Holtz machine was then connected with the metallic plate

under the house and the positive pole brought over the house from one to two inches from the rod. Large condensers were used, and the spark at each discharge struck the pointed rod and then darted straight to the brass knob and thence to the plate. Or, sometimes it went down through the roof straight to the plate. On filling a bomb with hydrogen and air and placing it in the circuit with a short break, the house was blown up when the spark passed! But the "scientific" men who experiment for the Chamber's company say that when the lightning strikes the rod at one end it should "diffuse" into the air by the other point! It seems almost like a waste of paper to expose such a patent imposition, but as the owners of this so-called "protector" are very persistent in pushing it before the public, I have been at some trouble to procure opinions from many eminent men as to the value of the "*Chamber's Lightning Protector*." Many of these have already been extensively published, but it is not likely to do any harm, but rather good, to keep the matter before the people.

In September, 1879, a printed circular was sent to a large number of the most eminent physicists asking questions respecting the best method of putting up lightning rods, and also requesting opinions of the Chambers's rod. Following are the opinions of this rod:

From President Morton, of Stevens' Institute of Technology, Hoboken, N. J.—"A dangerous attachment, liable to cause damage from lightning."

From Professor Loomis, of Yale College.—"Very dangerous. It is of no value whatever for protection, and so far as it produces any effect it would tend to attract the lightning from the clouds without affording any medium for transmitting the electricity safely to the earth. Nobody but a charlatan would recommend a lightning rod which has no metallic connection with the earth."

From Professor Young, of Princeton College.—"If it has no thorough connection with the ground it is worse than useless; an absolute invitation of danger."

From Professor Rowland, of John Hopkins' University, Baltimore.—"It is the worst humbug which has appeared in that line, and the proprietors of the patent should be arrested for selling the rod under the false pretense that it will protect a building."

From Professor Clarke, of Cincinnati University.—"It is absolutely useless. In theory it rests upon total misapprehension of some of the simplest physical laws. I have investigated it thoroughly. I have seen the Chambers experiments and know that no scientific man would indorse it for a moment."

From Dr. Kedzie, of Michigan Agricultural College.—"It is a scientific humbug."

From Professor Anthony, Cornell University, Ithaca, N. Y.—"It is worse than useless. It would increase the danger."

From Professor Harcey, of Arkansas University.—"My opinion is that it might be ornamental, but that it is worthless if not dangerous. Better have nothing at all."

From Professor Rood, Columbia College, N. Y.—"Worse than useless."

From Professor Trowbridge, Harvard College.—"I think it is a humbug. For the discharge would not respect the details between the rod and the building. Moreover, the electrical discharge will not necessarily strike such a rod in preference to the larger conductor which the house or building affords."

From T. A. Edison.—"Do not wish to be drawn into any controversy on the subject, but will simply state that the rods on my buildings all connect with the earth."

From Professor Davies, Wisconsin University.—"I should regard it as I regard much of the iron ornamental work put upon towers and around houses, *i. e.*, as adding to the risk of being struck by lightning."

From Professor Silliman, Yale College.—"That it is in flagrant violation with every accepted principle of electrical science, and should be prohibited if need be by legislative enactment."

From Professor Todd, Tabor College.—"I should think it admirably planned for drawing the electric discharge through the building."

From Professor LeConte, University of California.—"Such rods would afford no protection; on the contrary they would be dangerous."

From Professor Newcomb, U. S. Naval Observatory.—"If it has no connection with the ground I should not like to be under it during a thunder storm."

From Professor Pickering, Harvard Observatory.—"I should not use it."

From Professor Mayer, Stephens' Institute of Technology.—"From the description given by sentence, 'It is supported,' etc., to (.) period, I should say that the Chambers rod is utterly useless."

From Professor Hinrichs, Iowa State University.—"I have personally examined the Chambers rod. It is no lightning-rod in the ordinary sense of the word. I do not see any valid reason why such a contrivance should constitute a lightning protector. By pulling up any of the old-style rods from the dry ground into which it has been stuck, and turning this end up toward the sky, it will make about as good a 'protector' as the Chambers protector, whether insulated or not. The insulator furnished by the company is anyhow insufficient."

From Professor Le Roy Brown, Vanderbilt University, Nashville, Tenn.—"Not only useless but dangerous. For when glass insulators are wet by rain they conduct electricity, and thus the house would have a pointed rod without ground connection."

From Professor Safford, Williams College, Mass.—“Worthless; will not even protect from lightning rod men.”

From Professor O. N. Rood, Columbia College, N. Y.—“Worse than useless.”

From Professor Weed, Michigan University.—“Either a new and economical discovery, or an ignorant and misleading device that will do more harm than good. I do not believe it to be the first of these.”

The following replies were received from men to whom circulars issued by the company were sent. In one of them Professor Tyndall's name was used after a short quotation from one of his books, intended to support the Chambers rod.

ROYAL INSTITUTION OF GREAT BRITAIN, }
October 21, 1879. }

DEAR SIR:—I have received your letter referring to the “Chambers lightning-rod.” I have also received a circular in which a building provided with the rod is represented. This circular, moreover, contains a quotation from a small work of mine, intended, I suppose, to support the Chambers conductor.

Wanting a *good* earth connection the conductor is worse than useless. Instead of protecting buildings it is, in my opinion, calculated to promote their destruction. That the electricity should freely stream from the points as represented in the figure, a channel must exist to convey it freely from the earth to the points. Without this the building is liable at any moment to disruption.

Yours faithfully,

JOHN TYNDALL.

From Professor Anthony, Cornell University, N. Y.—“DEAR SIR:—Yours of 24th inst. at hand. The lightning rod described in the circular you send is certainly no protection whatever to a building. I am surprised that it should have been indorsed by any one who had any knowledge whatever of electrical science. You do well to warn the public against its use.”

From Professor Baird, Secretary Smithsonian Institute.—“SIR:—In reply to your inquiry concerning lightning rods, I have to say that while this institution does not undertake to criticise the various projects contrived by ignorance or dishonesty for deluding the public, I have no hesitation in giving you my opinion that the lightning rod referred to is arranged on wholly mistaken and unscientific principles. The quotation from Prof. Maxwell, of London, suggesting the theoretical but not very practical condition of surrounding a building, ‘roof, walls and ground floor, with sheet copper,’ is entirely misapprehended, and in its misapplication is well calculated to deceive the uninformed reader. An insulated rod with its opposite ends upturned, attached to the roof, is certainly as dangerous an appliance as could well be devised. With scattered iron or metallic masses through the house (such as almost always exist), with detached iron pipes outside, and perhaps water or gas-pipes in different rooms, or with even the imperfect conductors—human beings in upper and lower stories, such a contrivance

would, during a near thunder storm, almost infallibly invite a damaging and disruptive discharge, and is in fact the very arrangement frequently exhibited in the lecture-room as a class experiment to show the igniting and explosive effects of electricity, when a ‘protecting’ conductor is not continuous. * * In conclusion it may be stated that in a letter addressed to Josiah Morrow (Lebanon, Ohio), dated April 22, 1878, Prof. Henry, commenting on the very lightning rod in question, used the language: ‘In my opinion a rod put up in this manner is worse than none at all.’”

I call especial attention to the last letter because the agents of the company claim that Professor Henry endorsed the Chamber's system of rodding buildings. It seems that one of the last acts of his long and busy life was to condemn that rod as worse than none at all. All men who are competent to give an opinion of this rod unanimously condemn it as “useless” and even “dangerous.” There are no dissenting opinions on the question. And yet the agents are plying their trade all over our State and vending these dangerous instruments wherever they can find people who are ignorant or foolish enough to be deceived by their “experiments.” Surely our Legislature will not do its duty until it enacts a law prohibiting the sale of this rod in Iowa.

HOW LIGHTNING RODS SHOULD BE PUT UP.

The rods usually sold by peddlers are entirely too small. There should be four or five times as much metal in the rods as is generally put in them. Twisted and fented rods, as well as wide strips of metal are a delusion and a snare. They are only equal as conductors to a round rod having the same weight of metal per foot.

Size of Conductor—It should be from three-fourths of an inch to an inch in diameter, of solid iron. *The larger it is, the better.* A bar of solid half-inch square iron would be much better, however, than many of the rods put up on houses. The form of the cross-section is immaterial so the rod contains the requisite amount of metal, since the capacity of a rod to carry away a discharge, without melting, depends on the area of the cross-section, and not on the surface. If copper is used the rod need not be more than one-half or one-third as large as for iron.

Insulators of glass—These are useless if not harmful. Fasten the rod directly to the building with iron or copper straps, or staples. If there is a metallic roof or large masses of metal about the building, fasten the rod to them at their highest points. Fasten also to any large water pipes or gas mains in the building at the highest points.

Ground connection—This should be perfect. There is no question on this point. Damage from lightning, on buildings having rods, can generally be traced to a dry earth connection. If the rod simply sticks into dry earth a few feet it is useless. Better take it down. The way in which rods are too frequently put up, has brought disgrace on the name of Science. Dig a trench deep enough to strike permanently moist earth. Fasten a mass of old metal to the end of the rod, or surround it with pounded charcoal, cover up and all will be well. Or, fasten to a large water main, always turning the rod away from the house. The usual method practiced, of simply driving the rod down straight into the earth from three to eight feet, *has never been advocated by scientific men.* A well is an excellent terminus for the rod, but not a cistern. Let the upper end terminate in a point, not too sharp, and place one at each chimney, or ventilator, if a barn, and one at each gable, making the rods six to eight feet high, and near enough so each rod will protect a diameter of four times its height. Connect all the rods together, and also solder to metallic eave-troughs which may be near them. If the point of the rod can be gilded, or tipped, with copper or platinum, it would be well. All joints should be welded or fastened with close fitting screws, and the whole covered with a coat of black paint. Make all metallic connections by means of strips of copper or copper wire.

A continuous cable, made by twisting together from ten to twenty large fence wires would make a good rod. At the top the wires may be spread apart and pointed. In fact, I am convinced that six common fence wires, twisted together, would make about as good a lightning-rod as those usually sold. Avoid making sharp turns with the rod.

Cost of a rod—I present the following rough estimate of a good lightning-rod. Of course, the exact cost will vary to suit changes in locality and price of iron.

100 feet of $\frac{3}{4}$ in. rolled iron (150 lbs @ 5 cts).....	\$7.50
Copper point.....	.50
Painting.....	.50
Coupling or welding.....	1.00
	<hr/>
	\$9.50
The cost of putting up, and of a blacksmith to bend and weld where necessary, should not exceed.....	\$ 2.50
	<hr/>
Total cost per hundred feet.....	\$12.00

If one point is put at each gable-end and chimney, and all connected together, one conductor of three-fourths of an inch iron is enough to run to the ground. I am told that the cost per hundred feet when put up by average lightning-rod agents, is from \$40 to \$75 per hundred feet. No wonder they are anxious to sell their rods when the profits are so enormous. Whether our people should put rods on their houses or not, I shall not discuss. Statistics show that when properly put up, lightning-rods do protect objects from the effects of the direct discharge. The damage to ships in the English navy used to be very great until Snow Harris put copper strips on the masts and fastened them to the copper bottoms of the vessels. Since then the damage from lightning has been merely nominal, and Mr. Harris was conferred the honor of knighthood and given an annuity of \$1,500 for his services. For statistics on this question see Arago's *Meteorology*. Lightning-rods are genererally put up, not because the owner of the house has made up his mind to have one, but because some lightning-rod peddler has made up his mind to sell him a rod. If rods are to be put up at all let it be done on scientific principles.

APPENDIX.

THE BOARD OF TRUSTEES.

The subjoined list comprises the Board of Trustees, their officers, committees and the Board of Instruction:

THE HON. BUEL SHERMAN, Fredricksburgh,	- - -	1880.
THE HON. G. H. WRIGHT, Sioux City,	- - - -	1880.
THE HON. JOHN N. DIXON, Oskaloosa,	- - -	1882.
THE HON. H. G. LITTLE, Grinnell,	- - - -	1882.
THE HON. WILLIAM McCLINTOCK, West Union,	-	1882.

OFFICERS OF THE BOARD.

THE HON. JOHN N. DIXON, Oskaloosa, - - - CHAIRMAN.
E. W. STANTON, Ames, - - - - - Secretary.
W. D. LUCAS, Ames, - - - - - Treasurer.
J. L. GEDDES, Ames, - - - - - Deputy Treasurer.

STANDING COMMITTEES.

Executive Committee—Trustees WRIGHT, LITTLE, and McCLINTOCK.

Committee on Farm—Trustees LITTLE, McCLINTOCK, and SHERMAN.

Committee on Horticulture—Trustees SHERMAN, DIXON, and WRIGHT.

Committee on Workshop—Trustees WRIGHT and McCLINTOCK.

Committee on Forfeited Lands—Trustees WRIGHT and SHERMAN.

MEETINGS.

The annual meeting of the Board of Trustees is held on the second Wednesday in November; the other meetings are held in the latter part of November and in May.

OFFICERS OF INSTRUCTION.

A. S. WELCH, LL. D., PRESIDENT,
Professor of Psychology and Philosophy of Science.

GEN. J. L. GEDDES, M. PH., PRESIDENT *pro tem.*,
Professor of Military Tactics and Engineering.

W. H. WYNN, A. M., Ph. D.,
Professor of English Literature.

C. E. BESSEY, M. S., Ph. D.,
Professor of Botany.

A. THOMSON, C. E.,
Professor of Mechanical Engineering, and Superintendent of the Workshop.

F. E. L. BEAL, B. S.,
Professor of Civil Engineering.

T. E. POPE, A. M.,
Professor of Chemistry.

M. STALKER, B. S., V. S.,
Professor of Veterinary Science.

J. L. BUDD, M. H.,
Professor of Horticulture.

J. K. MACOMBER, B. S.,
Professor of Physics, and Librarian.

E. W. STANTON, B. S.,
Professor of Mathematics and Political Economy.

S. A. KNAPP, A. M.,
Professor of Practical and Experimental Agriculture.

D. S. FAIRCHILD, M. D.,
Professor of Histology, Pathology, and Therapeutics, and College Physician.

MRS. MARY B. WELCH, PRECEPTRESS,
Lecturer on Domestic Economy.

J. S. LEE, B. S.,
Assistant Professor in Chemistry.

MISS MARTHA SINCLAIR, ASSISTANT PRECEPTRESS,
Instructor in French and English.

J. C. HIATT,
Superintendent of the Farm.

T. L. SMITH, B. S.
Foreman in the Work-shop and Lecturer on Architecture.

F. W. BOOTH, B. S.,
Foreman and Instructor in the Printing Office, and
Assistant in Mathematics.

C. F. MOUNT, C. E.,
Assistant in Civil Engineering.

WINIFRED M. DUDLEY, B. S.,
Teacher of Instrumental Music.

G. S. FOX,
Teacher of Vocal Music.

MRS. A. THOMSON,
Housekeeper and Assistant in Experimental Kitchen.

H. D. HARLOW,
Proctor.

JUDICIARY.

The PRESIDENT; Professors GEDDES, WYNN, BESSEY, THOMSON,
BEAL, POPE, STALKER, BUDD, MACOMBER, STANTON, KNAPP and
MRS. WELCH.

GRADUATES.

GRADUATES OF 1878.

Gentlemen	15
Ladies	6
Total	<u>21</u>

GRADUATES OF 1879.

Gentlemen	15
Ladies	6
Total	<u>21</u>

SENIORS OF 1879.

Gentlemen	16
Ladies	7
Total	<u>23</u>

JUNIORS OF 1879.

Gentlemen	21
Ladies	6
Total	<u>27</u>

SOPHOMORES OF 1879.

Gentlemen	31
Ladies	17
Total	<u>48</u>

FRESHMEN OF 1879.

Gentlemen	75
Ladies	32
Total	<u>107</u>

SPECIAL STUDENTS OF 1879.

Gentlemen	2
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SUB-FRESHMEN OF 1879.

Gentlemen	49
Ladies	21
Total	<u>70</u>

POST GRADUATES OF 1879.

Gentlemen	3
Ladies	4
Total	<u>7</u>

COUNTY REPRESENTATION.

Adair	1	Jasper	6
Allamakee	2	Johnson	1
Audubon	2	Jones	9
Benton	5	Keokuk	11
Boone	11	Linn	2
Bremer	4	Mahaska	1
Calhoun	4	Marion	2
Carroll	2	Marshall	7
Cass	6	Mills	1
Cedar	6	Mitchell	1
Cerro Gordo	3	Monona	2
Cherokee	3	Montgomery	1
Chickasaw	2	Page	1
Clay	3	Palo Alto	2
Clayton	3	Pocahontas	1
Clinton	8	Polk	26
Crawford	4	Pottawattamie	1
Dallas	6	Poweshiek	5
Decatur	2	Ringgold	1
Delaware	6	Scott	6
Des Moines	5	Sioux	1
Dubuque	3	Story	56
Fayette	3	Taylor	2
Floyd	8	Wapello	6
Franklin	1	Warren	1
Greene	2	Washington	1
Grundy	1	Wayne	1
Guthrie	2	Webster	1
Hamilton	1	Winneshiek	1
Hardin	6	Woodbury	2
Harrison	3	Worth	1
Henry	1	Wright	2
Humboldt	2		
Jackson	1		
		Total	<u>284</u>
		Counties represented	66

APPENDED ARE THE ORIGIN AND LAWS ESTABLISHING THE AGRICULTURAL COLLEGE.

THE IOWA AGRICULTURAL COLLEGE was formally opened on the 17th of March, 1869. It will, consequently, at the close of the present term complete its eleventh year.

In 1858 the Legislature of Iowa passed an act to establish an Agricultural College for the purpose of giving a higher education to the industrial classes. By the same act means were provided for the selection of a farm, the location of College buildings, and for experimentation in agriculture. In 1859, a farm of six hundred and forty acres, situated in Story county, near Ames, was selected and purchased for the use of the College. In 1862 a bill was passed by Congress donating public lands to the several States which may provide Colleges for the benefit of agriculture and the mechanic arts.

The Ninth General Assembly, convened in extra session by proclamation of the Governor, passed an act—approved September 11, 1862—entitled, “*An act to accept the grant and carry into execution the trust conferred upon the State of Iowa by an act of Congress, entitled ‘An act granting public lands to the several states and territories which may provide colleges for the benefit of agriculture and the mechanic arts, approved July 2, 1862.’*” The State thereby accepted the grant upon the conditions and under the restrictions contained in said act of Congress, and required the Governor to appoint an agent to select and locate the land granted in said act, requiring said agent to report to the Governor and making it the duty of the Governor to lay a list of selections before the Board of Trustees of the Iowa Agricultural College at their next meeting for their approval, etc.; and appropriating \$1,000 to carry out the provisions of the act. (Acts Ex. Session, 1862, p. 25.)

The act accepting the Congressional grant under the conditions imposed, made the College a National Institution—the State becoming the trustee in charge.

In 1864 the lands, previously selected, amounting to 204,309 acres, were reported to the Legislature and confirmed by enactment as the perpetual endowment of the Agricultural College.

At the same session of the Legislature in which this munificent endowment was confirmed to the Agricultural College, Governor Kirkwood and Senators Gue and Clarkson formed a scheme for realizing an immediate fund by leasing the lands instead of offering them for sale. This scheme was approved by the Legislature and passed into a law which authorizes the trustees to lease for a term of ten years any of the endowment lands. The lessee, by the terms of the act, pays annually in advance eight per cent interest on the appraised value of the land, with a right to purchase at the expiration of the lease. In the case of failure in the prompt payment of the interest when due, the land with all improvements reverts to the College.

Annexed is the full text of the Congressional law passed 1862, granting lands to colleges of agriculture and the mechanic arts:

“Be it enacted by the Senate and House of Representatives of the United States, in Congress assembled, That there be granted to the several states for the purpose hereinafter named, an amount of the public land, to be apportioned to each State, a quantity equal to thirty thousand acres for each Senator and Representative in Congress to which the States are respectively entitled, by the apportionment under the census of 1860; Provided, That no mineral lands shall be selected under the provisions of this act.

SEC. 2. *And be it further enacted, That the land aforesaid, after being surveyed, shall be apportioned to the several States in sections or sub-divisions of sections not less than one quarter of a section; and whenever there are public lands in a State subject to sale at private entry at one dollar and twenty-five cents per acre, the quantity to which said State shall be entitled shall be selected from such lands within the limits of such State, and the Secretary of the Interior is hereby directed to issue to each of the States in which there is not the quantity of public lands subject to sale at private entry at one dollar and twenty-five cents per acre, to which said State may be entitled under this act, land-scrip to the amount in acres for the deficiency of its distributive share; said scrip to be sold by said States and the proceeds thereof to be applied to the uses and purposes prescribed in this act, and for no other use or purpose whatever; Provided, that in no case shall any State to which land-scrip may thus be issued, be allowed to locate the same within the limits of any other State, or any territory of the United States, but their assignee may thus locate said land-scrip upon any of the unappropriated lands of the United States subject to sale at private entry at one dollar and twenty-five cents or less per acre; and Provided further, That no more than one million acres shall be located by such assignee in any of the*

States; and *Provided further*, That no such location shall be made before one year from the passage of this act.

SEC. 3. *And be it further enacted*, That all the expenses of management, superintendence, and taxes from date of selection of said lands previous to their sale, and all the expenses incurred in the management and disbursement of the moneys which may be received therefrom, shall be paid by the State to which they may belong, out of the treasury of said State, so that the entire proceeds of the sales of said lands shall be applied without any diminution whatever to the purposes hereinafter mentioned.

SEC. 4. *And be it further enacted*, That all moneys derived from the sale of the lands aforesaid by the States to which the lands are apportioned, and from the sale of land-scrip hereinbefore provided for, shall be invested in stocks of the United States, or of the States, or some other safe stocks, yielding not less than five per centum upon the par value of said stocks; and that the money so invested shall constitute a perpetual fund, the capital of which shall remain forever undiminished, (except so far as may be provided in section five of this act), and the interest of which shall be inviolably appropriated by each State, which may take and claim the benefit of this act to the endowment, support, and maintenance of at least one college, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the States may prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life.

SEC. 5. *And be it further enacted*, That the grant of land and land-scrip hereby authorized shall be made on the following conditions, to which, as well as to the provisions hereinbefore contained, the previous assent of the several States shall be signified by legislative acts:

First.—If any portion of the fund invested as provided by the foregoing section, or any portion of the interest thereon shall, by any action or contingency, be diminished or lost, it shall be replaced by the State to which it belongs, so that the capital of the fund shall remain forever undiminished, and the annual interest shall be regularly applied, without diminution, to the purposes mentioned in the fourth section of this act; except that a sum not exceeding ten per centum upon the amount received by any State under the provisions of this act, may be expended for the purchase of lands for sites of experimental farms, whenever authorized by the respective legislatures of said States.

Second.—No portion of said fund nor the interest thereon, shall be applied directly or indirectly, under any pretense whatever, to the purchase, erection, preservation, or repair of any building or buildings.

Third.—Any State which may take and claim the benefit of the provisions of this act *must* provide, within five years at least, not less than one college, as described in the fourth section of this act, or the grant to such State shall cease; and said State shall be bound to pay the United States the amount re-

ceived of any lands previously sold, and that the title to purchasers under the State shall be valid.

Fourth.—An annual report shall be made regarding the progress of each college, recording any improvements and experiments made, with their cost and result, and such other matters, including State, industrial and economical statistics, as may be supposed useful; one copy of which shall be transmitted by mail free by each to all the other colleges which may be endowed under the provisions of this act, and also one copy to the Secretary of the Interior.

Fifth.—When lands shall be selected from those which have been raised to double the minimum price in consequence of railroad grants, they shall be computed to the State at the maximum price and the number of acres proportionately diminished.

Sixth.—No state while in a condition of rebellion or insurrection against the government of the United States shall be entitled to the benefit of this act.

Seventh.—No State shall be entitled to the benefits of this act, unless it shall express its acceptance thereof by its legislature within two years from the date of its approval by the President.

SEC. 6. *And be it further enacted*, That land-scrip issued under the provisions of this act, shall not be subject to location until after the first day of January, 1863.

SEC. 7. *And be it further enacted*, That the land officers shall receive the same fees for locating land-scrips issued under the provisions of this act, as is now allowed for the location of Military Bounty Land Warrants under existing laws; *Provided*, Their maximum compensation shall not thereby be increased.

SEC. 8. *And be it further enacted*, That the Governors of the several States to which scrip shall be issued under this act, shall be required to report annually to Congress all sales made of such scrip until the whole shall be disposed of, the amount received for the same, and what appropriation has been made of the proceeds.—(U. S. Stat. 1861-2, p. 503.)

For easy reference by those who desire to gain a complete knowledge of this National Institution, which is under the care of the State, we subjoin the entire laws of the General Assembly relating to its organization and management taken from the Code:

COLLEGE AND FARM CONTROLLED BY A BOARD OF FIVE TRUSTEES.

SECTION 1604. The lands, rights, powers, and privileges, granted to and conferred upon the State of Iowa by the act of Congress entitled, "An act donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts," approved July 2, 1862, are hereby accepted by the State of Iowa, upon the terms, conditions, and restrictions contained in said act, and there is hereby established an

Agricultural College and Model Farm, to be connected with the entire agricultural and mechanical interests of the State; the said college and farm to be under the control and management of a board of five trustees, no two of whom shall be elected from the same congressional district.

THE BOARD—HOW ELECTED—WHO IS INELIGIBLE.

SEC. 1605. The present board of trustees shall continue in office until the first day of May, A. D. 1874, and the General Assembly at their regular session in said year, shall elect three trustees to serve for four years, and two trustees to serve for two years from the first day of May, A. D. 1874; and the General Assembly at each regular session thereafter shall elect the number of trustees which may be necessary to keep the board full. Any vacancies in said board caused by death, removal from the district or State, resignation, or failure to qualify within sixty days after election, may be filled by appointment by the Governor; *Provided*, That neither the president nor any other officer or employe of the college and farm, nor any member of the General Assembly, shall be eligible as such trustee.

POWERS OF THE BOARD.

SEC. 1606. The board of trustees shall have power:

1. To elect a chairman from their own number, a president of the college and farm, a secretary, a treasurer, professors and other teachers, superintendents of departments, a steward, a librarian, and such other officers as may be required for the transaction of the business of the board; also to fix the salaries of officers and prescribe their duties; and to appoint substitutes who shall discharge the duties of such officers during their temporary absence;
2. To manage and control all the property of the college and farm, whether real or personal;
3. To make all rules and regulations for the government of the college and farm;
4. To establish rules regulating the number of hours which shall be devoted to manual labor, and to fix the compensation therefor; *Provided*, no student shall be exempt from labor except in cases of sickness or other infirmity, or where students from the advanced classes may be employed as teachers;
5. To arrange courses of study and practice, and to establish such professorships as they may deem best to carry into effect the provisions of this chapter; also to prescribe conditions of admission to the college;
6. To grant diplomas, on the recommendation of the faculty, to any student who has completed either of the industrial courses prescribed by said board, or an equivalent thereof;
7. To remove any officer by a majority vote of all the members of the Board of Trustees;

8. To direct the expenditure of all appropriations which the General Assembly shall from time to time make to said college and farm, and the income arising from the Congressional grant, and from all other sources;
9. To keep a full and complete record of their proceedings, and to do such other acts as are found necessary to carry out the intent and meaning of this chapter.

QUORUM.

SEC. 1607. A majority of the Trustees shall be a quorum for the transaction of business.

COMPENSATION OF BOARD.

SEC. 1608. The Trustees shall receive as their compensation four dollars a day for each and every day actually employed in the discharge of their duties, and five cents per mile for each and every mile actually traveled on such business; *Provided*, that no member shall receive compensation for more than thirty days in each year. The Auditor of State is hereby authorized to audit and allow the claims of the Board of Trustees in accordance with this section.

ANNUAL MEETINGS.

SEC. 1609. The annual meetings of the Board of Trustees shall be held at the Agricultural College on the second Wednesday of November.

COLLEGE YEAR, AND REPORT OF TRUSTEES TO GOVERNOR.

SEC. 1610. The college year shall begin on Thursday after the second Wednesday of November of each year, and end on the second Wednesday of November of the following year. The biennial report of the Board shall be filed in the office of the Governor, not later than the first day of December preceding the regular meeting of the General Assembly. The Governor shall cause three thousand copies of the report to be printed and bound in paper and distributed as follows: one thousand copies to the Agricultural College, and the balance to be distributed as provided by chapter ten of title two of part first of this Code.

PRESIDENT; HIS POWER AND DUTY.

SEC. 1611. The President of the College and farm, shall control, manage, and direct the affairs of the College and farm herein established, subject to such rule as may be prescribed by the Board of Trustees, and shall report to said Board of Trustees at their annual meeting in November, and at such other times as they shall direct, all his acts as such President, and the condition of the several departments of the College and farm, together with his recommendations for the future management thereof.

SECRETARY.

SEC. 1612. The Secretary shall keep the documents and a record of the proceedings of the Board of Trustees, and conduct their official correspondence. All acts of the Board of Trustees as to the management, disposition, or use of the lands, funds, or other property of the institution, shall be entered in the record of its proceedings, and said record shall show how each member voted on each proposition. He shall also make the biennial report of the board to the General Assembly. Upon the election of any person to an office under said Board, he shall give notice thereof to the Secretary of State. He shall also keep an account with the Treasurer, charging him with all moneys paid to him from any source, and crediting him with the amounts paid out by him upon the order of the Board of Audit, which account shall be balanced monthly.

BOARD OF AUDIT.

SEC. 1613. The President and Secretary shall constitute a Board of Audit, who shall, under the rules of the Board of Trustees, examine all bills presented for payment, and no bill shall be paid without their joint endorsement thereon; *Provided*, That no bill shall be so audited for whose payment the Board of Trustees has not made appropriation; also, the said Board of Audit shall examine the Treasurer's books and vouchers monthly, and at such other times and so often as they shall deem necessary. All the proceedings contemplated in this section shall be reported by the Secretary to the Board of Trustees at each meeting thereof.

TREASURER.

SEC. 1614. The Treasurer shall receive and keep all notes and other evidence of indebtedness, contracts, and all moneys arising from the income of the Congressional grant, from the appropriations of the General Assembly, from the sales of the products of the farm, from the payments of students, and from all other sources, and shall pay out the same upon bills duly audited as above prescribed, and he shall retain such bills with the receipt for their payment as his vouchers; but no bill shall be paid for which appropriation had not been made by the Board of Trustees. He shall keep an accurate account of the revenue and expenditures of said College and farm from all sources, and in such manner that the receipts and disbursements of each and every one of the several departments thereof shall be apparent at all times, and the gains or losses in such departments shall be carefully set forth; and he shall report to the Board of Trustees at their annual meeting in November and at such other times as they shall direct. He shall also execute duplicate receipts of all money received by him, specifying the source from which received and the fund to which it belongs, one of which must be filed with the Secretary, and no receipt for money paid by him shall be valid unless the duplicate is so filed. The Treasurer shall be elected annually, and give a bond every year in double the highest amount of money

likely to be in his hands, at any one time, with such sureties as the Executive Council shall prescribe, and said bond shall be filed in the office of Secretary of State, and the Treasurer may appoint a deputy who shall reside at the College, and the Board of Trustees shall fix the compensation to be paid to such deputy, and the Treasurer shall be responsible on his official bond for all acts done by such deputy.

OFFICES OF PRESIDENT AND SECRETARY, AND OATH OF OFFICE.

SEC. 1615. The President and Secretary shall have their respective offices, at the College, and they, with the Treasurer, shall take and prescribe the oath provided in section one hundred and twenty-six, chapter nine, title two of this Code.

THE BOARD TO LEASE THE LANDS BELONGING TO THE COLLEGE.

SUBSTITUTE FOR SEC. 1616. The Board of Trustees of the Iowa State Agricultural College and farm are hereby authorized to lease the land granted to the State of Iowa by an act of Congress entitled, "An act donating public lands to the several States and Territories, which may provide colleges for the benefit of agriculture and the mechanic arts," approved July 2, 1862, in amount not exceeding one hundred and sixty acres to any one person, for a term not exceeding ten years, the lessee to pay eight per cent per annum in advance upon the price of said land, which is hereby declared to be not less than fifty per cent additional to the price at which each piece of said land, respectively, was appraised by the Board of Trustees in the year 1865; and the said lessee shall have the privilege of purchasing said land at the expiration of the lease at the price aforesaid. The lessee failing to pay the interest upon said lease within sixty days from the time the same becomes due, shall forfeit his lease, together with the interest paid thereon and the improvements made on said land. The said Board of Trustees are also authorized to renew leases heretofore made for a term not exceeding ten years from the date of such renewal, the rate of interest to be eight per cent, and when leases are so renewed the lands shall be subject to assessment for taxation at the end of ten years from the date of the original lease. The Board of Trustees shall cause to be certified to the auditors of the several counties in which said lands are situated, a list of said land which may be subject to taxation as herein provided; *Provided*, That the re-leasing of this land shall be done by the Secretary of the said College without extra compensation.

MONEY ARISING FROM THE SALE OF LANDS TO BE PAID TO STATE TREASURER AND INVESTED BY HIM.

SUBSTITUTE FOR SEC. 1617. The moneys arising from the sale of said lands shall be paid into the State treasury, and shall be invested by the State Treasurer subject to the approval of the executive council, in stocks of the United States, or of the States, or some other safe stocks yielding not less than five per centum on the par value of said stocks as directed by the act of Con-

gress granting said lands, and the money arising from the interest on said stocks, on the deferred payments, and on the leases of said lands as rental thereof, shall be paid over to the Board of Trustees, and may be loaned by said Board of Trustees on good and sufficient security when not needed to defray such expenses of the College, as said moneys are legally applicable to.

BOARD TO APPOINT AGENTS WHO SHALL GIVE BONDS.

SEC. 1618. The Trustees are hereby endowed with all the necessary authority to appoint agents, or do any other acts necessary to carry out the provisions of the three preceding sections. But no such agent shall be appointed with authority to receive any money until he has executed a good and sufficient bond to be approved by the Trustees in a sum double the amount he will be likely to receive. And every such agent shall make a monthly statement under oath to the College Treasurer of the amount received by him, and transmit therewith all funds shown to be in his hands.

FREE TUITION AND PRIOR RIGHT OF COUNTIES.

SEC. 1619. Tuition in the College herein established shall be forever free to pupils from this State over sixteen years of age, who have been residents of the State six months previous to their admission. Each county in this State shall have a prior right to tuition for three scholars from such county, the remainder, equal to the capacity of the College, shall be by the Trustees distributed among the counties in proportion to the population, subject to the above rule. Transient scholars otherwise qualified may at all times receive tuition,

SALE OF LIQUORS, WINE, AND BEER PROHIBITED.

SEC. 1620. No person shall open, maintain, or conduct any shop or other place for the sale of wine, beer, or spirituous liquors, or sell the same at any place within a distance of three miles from the Agricultural College and farm; *Provided*, That the same may be sold for sacramental, mechanical, medicinal or culinary purposes; and any person violating the provisions of this section shall be punished, on conviction by any court of competent jurisdiction, by a fine not exceeding fifty dollars for each offense, or by imprisonment in the county jail for a term not exceeding thirty days, or by both such fine and imprisonment.

BRANCHES OF STUDY.

SEC. 1621. The course of instruction and practice in said College shall include the following branches: natural philosophy, chemistry, botany, horticulture, fruit-growing, forestry, animal and vegetable anatomy, geology, mineralogy, meteorology, entomology, zoology, the veterinary art, plain mensuration, leveling, surveying, book-keeping, and such mechanic arts as are directly connected with agriculture; also, such other studies as the Trustees may from time to time prescribe not inconsistent with the purposes of this chapter.

MONEY CANNOT BE GIVEN FROM APPROPRIATION FUND.

SEC. 1622. No money shall be diverted from the fund to which it belongs, or used for any other purpose than is provided by law, and any Trustee, officer, or employe of said institution who may, by vote, direction, or act, violate the provisions of this section, shall be punished by fine not exceeding one thousand dollars, or by imprisonment in the penitentiary or county jail not less than six months.

ORGANIZATION.

APPENDED IS A BRIEF EXHIBIT OF THE PLAN OF ORGANIZATION, WITH CONDITIONS OF ENTRANCE.

Under the sanction of National law, and in harmony with the plan adopted at its opening, the Agricultural College has developed four distinct general courses of study. These courses of study which the Faculty have carefully and completely revised, will afford the student a rare opportunity to gain the "liberal and practical education" required by the congressional law. No pains have been spared to form curricula that are well balanced; for while the technical studies that give to each course its special character are fully represented, there are not wanting those branches that contribute to a wider culture.

THE COUSES OF STUDY.

1. THE COURSE IN SCIENCES RELATED TO AGRICULTURE.
2. THE COURSE IN MECHANICAL ENGINEERING.
3. THE COURSE IN CIVIL ENGINEERING.
4. THE LADIES' COURSE IN SCIENCE.

SPECIAL COURSES.

For the purpose of giving some freedom of choice within the general courses and of meeting urgent demands outside of them, there have been organized *three special courses*:

1. COURSE FOR JUNIORS AND SENIORS IN SPECIAL INDUSTRIAL SCIENCES.
2. POST-GRADUATE COURSES OF STUDY.
3. THE PRELIMINARY COURSE.

SCHOOLS.

In order to attain a complete system the four general courses above mentioned, have been divided into twelve Schools, each embracing either a single prominent science or a small number of closely related sciences:

1. SCHOOL OF AGRICULTURE.
2. SCHOOL OF HORTICULTURE.
3. SCHOOL OF VETERINARY SCIENCE.
4. SCHOOL OF DOMESTIC ECONOMY.
5. SCHOOL OF MILITARY SCIENCE.
6. SCHOOL OF LITERATURE AND LANGUAGE.
7. SCHOOL OF MATHEMATICS AND PHYSICS.
8. SCHOOL OF CHEMISTRY.
9. SCHOOL OF BIOLOGY.
10. SCHOOL OF PHILOSOPHY.
11. SCHOOL OF MECHANICAL ENGINEERING AND ARCHITECTURE.
12. SCHOOL OF CIVIL ENGINEERING.

BUILDINGS.

The COLLEGE BUILDING is four stories high above the basement, and is 158 feet long by 112 feet deep through the wings. In the basement are the dining-hall, kitchen, laundry, experimental kitchen and laundry, printing office, and armory. On the first floor are the chapel, president's office, cashier's office, and library. The second floor contains several recitation rooms and rooms for students. The third and fourth floors contain student rooms and the museum. Two hundred and twenty students can be accommodated in the building. All the rooms are heated by steam and lighted with gas. Water is supplied in all the stories.

The LABORATORY is a spacious two-story brick building, dimensions 70x44 feet, with an extension one story high, 61x33 feet. The first floor is devoted to chemistry, the second to physics, and two drawing-rooms occupy the attic. The basement contains the machine shop and a large recitation room. This building is warmed by an independent steam-heating apparatus, and is supplied with water and gas.

The departments of BOTANY and VETERINARY SCIENCE are located in a handsome brick building in the Italian style. On the first floor are the Botanical laboratory, lecture room, and the professor's room. On the second floor are found the Veterinary lecture room, museum, and professor's room. Behind this building is the Veterinary hospital and dissecting room.

The HORTICULTURAL BUILDING is a neat structure, containing on the first floor a well-furnished lecture-room, professor's room, and seed room. On the second floor is the Horticultural museum. The cellar has two spacious rooms, one for the storage of garden products, the other for the use of the nursery propagating department. A grafting

neat room and propagating structure are attached, heated with hot-water pipes.

The FARM HOUSE is a substantial, plain, brick building, occupied by the Farm Superintendent, and accommodating several students. The College Creamery is a low frame building, just east of the farm house. The farm barns are adjacent—one of brick, for horses, and one large frame barn in the basement of which is a stable for one hundred head of cattle.

The WORK-SHOP, LAUNDRY and GAS-WORKS are some distance behind the main building. The work-shop is a two-story frame building, fitted up with machinery and tools for the prosecution of repairs and for instruction in mechanical work.

Professors Budd, Thomson, Pope, and Stanton, occupy substantial houses on or near the College grounds. The president's house, a fine example of the Gothic style, is now building, and is near the entrance to the grounds.

REQUIREMENTS FOR ENTRANCE.

1. The age of students seeking admission to the Agricultural College must be sixteen years or over.
2. Every student on entering the College signs the following contract:

We, the Faculty of the Iowa Agricultural College, hereby agree that we will guarantee to the students of 1880, all the privileges and instructions set forth in the Seventh Biennial Report, and that the laws we make shall be simply for their advancement and the good government of the institution.

A. S. WELCH, *President.*

We, the Students, hereby agree on entering the College in 1880, that we will respect its laws, and, except in case of illness, unforeseen misfortune, or the necessity of leaving to teach school, remain the entire term on which we enter.

ENTRANCE EXAMINATIONS AND CERTIFICATES.

3. Candidates for membership in the Freshman class must give evidence of a thorough knowledge of English Grammar, English Analysis, Human Physiology, Arithmetic, and Algebra through simple equations. Proficiency in these studies may be proved either by actual

examinations held at the opening of the term, or by a certificate given on special examinations by either the principal of a high school or a County Superintendent. Teacher's certificates will not be received. For details of Entrance Examinations, see index.

ADMISSION TO SPECIAL SCHOOLS.

4. Students of the required age and preparation, may, on application to the President, pursue exclusively the course belonging to any special school; but the studies of such special student will be confined strictly to the school he enters.

STUDIES PREPARATORY TO ENTERING THE SCHOOL OF VETERINARY SCIENCE.

5. Young men who desire to take the course in Veterinary Science without entering the College proper, must give evidence, either by examination or the certificate above mentioned, of proficiency in all the studies required for admission to the Freshman class, except Algebra.

SUB-FRESHMAN CLASS.

6. For the purpose of giving a better preparation for the Freshman class to the students who come from sections of the State where the schools are defective, a limited number will receive instruction in English Analysis, History, Physiology, and the elements of Algebra and Geometry. Students entering this class must, hereafter, show by examination or certificate a thorough knowledge of English Grammar and Arithmetic.

HOW TO ENTER THE AGRICULTURAL COLLEGE.

Those who desire to enter the Agricultural College at the opening of the spring term, March 1, 1880, or for the fall term which commences July 21, 1880, will comply with the following directions:

1. Write the President, if possible before the first of February, asking for a *card of enquiry*. It will be mailed to you at once.
2. On receiving the card of enquiry, write an answer opposite each question in the list; then enclose and mail it to the President. If the answers you give accord with the "Requirements for Entrance," a card of admission will be sent you.
3. When you arrive at the opening of the term, present this card of admission to the Treasurer; select your room; pay the rent; make

your deposit; and, without loss of time, show your receipt therefor to the President at his office. If you have not a certificate of proficiency in the studies required, you will then secure a card of examination.

4. Attend punctually every examination at the time and place indicated on the card. When all the examinations are completed and your standing therein marked on the card, return it to the President. If you have passed the studies required with a standing of 3 or over, 4 being perfect, you will then sign the Student's Record Book and secure a *card of classification*.

5. Present the card of classification to each of the teachers having charge of the classes to which you are assigned. Get your name enrolled on the class list and attend thereafter every recitation of the term.

THE CARD OF ENQUIRY.

The card of enquiry to be sent on application, contains the following questions to be answered and returned by mail:

QUESTIONS RESPECTING MATTERS ESSENTIAL TO ADMISSION.

1. Are you sixteen years old, or older?
2. Are you proficient in the studies required for admission to the Freshman class?
3. Will you, if admitted, remain one entire term, unless prevented by sickness or unforeseen misfortune?

QUESTIONS NOT ESSENTIAL TO ADMISSION.

1. Do you intend to complete one of our courses of study?
2. What is your father's occupation?
3. Do you desire to pay a limited portion of your expenses in work?

GOVERNMENT.

The crowded buildings of the Agricultural College and the nature of its exercises, complicated as they are by manual labor, make order, punctuality, and systematic effort indispensable. This institution can therefore offer no inducements to the idler or the self-indulgent. Those, moreover, who are too independent to submit to needful authority, or too restless to accept wholesome restraint, are advised to go where the courses of study are milder and the requirements are consequently less. The education attained here is the result of energetic effort made possible by a uniform system of conduct and study. The following regulations give the institution the highest efficiency and secure to the student the largest possible return for time and expense.

1. The hours from seven to ten o'clock on week-day evenings, and from 7:30 A. M. to 12 M., and from 1 P. M. to 5 P. M. of all week-days except Saturday, are employed in study, recitation, and labor.

2. Students must attend punctually all exercises of the classes to which they belong, except in cases of illness or unavoidable detention.

3. When students have for the above reasons been absent from any exercise, they shall, in person, as soon as possible, present their reasons for such absence to the President. If absent from any recitation they shall without delay obtain from the professor in charge a written recommendation for excuse for such absence, which shall be presented to the President for approval. No one is permitted to attend a second recitation after an *unexcused* absence.

4. Students boarding and rooming in any building on the College Farm shall be subject to the same regulations as those boarding and rooming in the College building.

5. Students boarding outside the College grounds shall, so far as possible, keep study hours in their rooms. In the intervals between recitations at the College building they shall remain in the chapel, keeping such order as is essential to uninterrupted study. Access to the rooms and halls of the sections requires special permission.

6. Examinations shall be conducted in writing, when possible, upon questions proposed by the instructors of the various classes, and no special examinations will be granted except on such days as the faculty may set apart for that purpose.

7. No student shall graduate from this College who has not passed an examination and attained a standing of *three* (four being perfect) in each of the studies of the course in which he proposes to graduate. Studies which are pursued for a part of a term, or a part of the time during any term, shall be counted proportionately to such part.

PROHIBITORY LAWS FOR THE COLLEGE BUILDING.

1. Students may not leave the vicinity of the College building at any time without permission from the President. General permission to be absent on Saturday is granted by the President.

2. Loud talking, whistling, scuffling, gathering in halls and staircases, and boisterous and noisy conduct, are *at all times* forbidden.

3. During study hours, when not engaged in work or recitation, students may not leave their rooms except for unavoidable reasons.

4. At 10 o'clock P. M., lights shall be extinguished, and from this

time to the rising bell no student may be out of his room, except for serious reasons, nor shall he in any way disturb his neighbors.

5. Students shall not deface by marking, cutting, or otherwise any building, walls, or furniture belonging to the College.

6. Students shall not abstract or remove any article, whether clothing, food, furniture, tools, fruit, flowers, or any other property belonging to the College. Damage, destruction, or theft of property, when not more than one dollar in value, will be punished by fine double the amount, but when exceeding that sum the case will be handed over to the civil authorities.

7. Card playing and other games of chance, cooking, and the use of tobacco and intoxicating beverages, in any of the rooms of the College buildings, are strictly forbidden.

LITERARY SOCIETIES.

No literary, scientific, or other society shall be organized without the approval of the President and faculty. The existing societies, four in number, meet on Saturday evening and close their sessions at or before 10:15. Students not attending the meetings of these societies shall observe the order and quiet required on other evenings of the week.

PUBLIC WORSHIP AND RELIGIOUS INSTRUCTION.

The faculty require in and about the College building such quiet and decorum as are fitting to the observance of the Sabbath. Officers and students gather daily in the chapel for public worship. A Bible class, led by some older student, has its exercises on Sunday, at 1 P. M. The students' prayer meeting is held on Sunday evening, and on Sunday afternoon at 2:30 a discourse is given in the chapel by the President, Professor Wynn, or a clergyman invited for the occasion. The object of these sermons is to emphasize and enforce the precepts of the Christian religion, but, in a state institution like this, it would be manifestly improper to teach or to controvert the tenets of sectarianism.

STUDENTS' EXPENSES.

1. No charge is made for tuition.
2. Expenses incident to the general management of the College are paid from the College interest fund.
3. For board, washing, heating, lighting, and cleaning the College

building, students pay what the items actually cost the institution. Injury to College property, of whatever sort, will be charged to the author, when known; otherwise to the section or the entire body of students.

4. Students boarding in the College building furnish their own bedding, such as pillows, blankets, ticks, etc. All young men will be required to supply themselves with uniforms. (See School of Military Science.)

THE DINING HALL.

5. The dining hall will be opened on the evening preceding the respective days on which the spring and fall terms commence. Since the boarding department receives no aid from the State, and consequently is sustained wholly by receipts from the boarders, it cannot give gratuitous entertainment to any. Students and others bringing friends to its tables, are therefore required to pay for such twenty-five cents each meal.

DEPOSIT.

6. As security for the payment of his month's bills, each student, at the opening of the term, deposits with the Treasurer the sum of twenty dollars; and on showing the receipt therefor to the President, and signing the record, receives his card of examination or classification. This deposit will be returned on final settlement at the close of the term.

MONTHLY SETTLEMENT.

7. All bills for each month must, without fail, be settled at the Treasurer's office on the second Saturday of the month following. Those who neglect this settlement cannot, without special permission, be permitted to remain in the College.

8. The current expenses of students boarding in the building the present year are as follows. Should any changes of rates be made hereafter, for the year 1880, all applicants will be duly notified:

Board, per week.....	\$2.50
Lighting and heating, per week.....	.40
Incidentals, per week.....	.21
Room rent, per term.....	\$1.00 to 3.50
Washing, average per dozen.....	.50
Janitor's fee, for students not boarding in the building, per term.....	5.00

TEXT BOOKS.

9. Text-books and stationery may be purchased from the College Treasurer at ten per cent advance on cost. Our stock is bought at publisher's prices.

CARE OF MONEY.

10. Students are advised to keep their money and other valuables in the College safe. While doing all in their power to prevent losses and punish theft, the officers will not be responsible for money or articles lost or stolen from the persons or rooms of the students.

MANUAL LABOR.

The following rules regulating manual labor have been made by the Board of Trustees. It will be seen that no student can pay more than from a third to a half of his expenses in work.

1. The manual labor required by law of students in the College, is divided into two kinds, viz: unproductive labor, which shall be compensated by the payment of wages; and instructive labor which shall be compensated by the instruction given and the skill acquired.

2. Unproductive labor shall comprise all the operations in the work-shop, garden, dining-room, printing-office, upon the farm and elsewhere, in which the work done accrues to the benefit of the College and not the benefit of the student. Instructive labor shall embrace all those operations in the work-shop, museum, laboratory, experimental kitchen, upon the farm and garden, in which the sole purpose of the student is the acquisition of skill and practice.

3. Members of the Freshman and sub-Freshman classes may engage in unproductive labor three hours a day four days a week, at the rate of from four to ten cents per hour.

4. The members of the higher classes shall engage in instructive labor in the presence and under the instruction of the professor in charge according to the statements made in the time-table of each of the courses of study.

5. Special details will be given by the President, on nomination by heads of departments, *to the most faithful and meritorious students of the higher classes*, at the rate of pay for instructive labor.

6. Students of the higher classes may, at their option, engage in unproductive labor at the same rate and under the same conditions as the Freshman class.

7. Students capable of acting efficiently as foremen, on appointment to such duty by the Superintendents, may receive increased pay not to exceed fourteen cents per hour.

THE COURSES OF STUDY.

The following courses lately revised by the Faculty include the studies required by statute, together with those subsequently added by the Board of Trustees. [See section 1621, page 142 of this Report.]

1. THE COURSE IN SCIENCES RELATED TO AGRICULTURE.
2. THE COURSE IN MECHANICAL ENGINEERING.
3. THE COURSE IN CIVIL ENGINEERING.
4. THE LADIES' COURSE IN SCIENCE.
5. COURSE FOR JUNIORS AND SENIORS IN SPECIAL INDUSTRIAL SCIENCES.
6. POST-GRADUATE COURSES OF STUDY.
7. THE PRELIMINARY COURSE.

THE COURSE IN SCIENCES RELATED TO AGRICULTURE.

SPECIAL FACULTY.

THE PRESIDENT.

Professors KNAPP (Dean),
STALKER,
BESSEY,
BUDD,
MACOMBER,

POPE,
BEAL,
STANTON,
WYNN,
GEDDES.

PURPOSE.

The purpose of the course in the sciences related to Agriculture, is to make scientists in the branches which are related to agriculture. It aims, moreover, to prepare students who desire it, for scientific farming. Incidentally it furnishes to all the means of attaining an education which is thoroughly practical.

COURSE OF STUDY.

The course consists of the required antecedent studies in the Freshman year and the first term of the Sophomore year, of the general branches pursued in the Sophomore, Junior, and Senior years, and of the technical studies which predominate throughout.

GRADUATION.

The candidate for graduation in this course must have secured a standing of at least three (four being perfect) in all the studies (not optional) of the subjoined list, and present a final thesis as required by college law.

COURSE OF STUDY.

FRESHMAN YEAR.

FIRST TERM.

Practical Agriculture—(2); Advanced Algebra—(5) fourteen weeks; Geometry begun—(5) four weeks; Book-keeping—(3); *Rhetoric*—(3), or *Latin*—(5), or *German*—(5); Drawing—(3); Composition—(1).

SECOND TERM.

Practical Horticulture—(2); Elementary Botany—(2); Descriptive Zoology—(2); Geometry—(5); *Peabody's Moral Science*—(3), or *Latin*—(5), or *German*—(5); Drawing—(3); Composition—(1).

SOPHOMORE YEAR.

FIRST TERM.

Systematic Botany—(2); General Chemistry—(3); General Zoology—(2); Plane Trigonometry—(5) nine weeks; Land Surveying—(5) nine weeks; Physics: Mechanics of Solids, Liquids, and Gases—(2).

SECOND TERM.

Horticulture—(2); Stock-Breeding—(1); Economic Botany—(2); General Chemistry—(2); Entomology and Vertebrate Zoology—(5); Physics: Light and Sound—(3); **Analytical Geometry*—(5).

JUNIOR YEAR.

FIRST TERM.

Horticulture—(1); Vegetable Physiology—(4) eleven weeks; Cryptogamic Botany—(4) seven weeks; Quantitative Chemistry—(2); Physics: Heat—(3); English Literature—(5); **Differential and Integral Calculus*—(5).

SECOND TERM.

Horticulture—(1); Landscape Gardening—(3) nine weeks; Farm Engineering—(3) nine weeks; Organic Chemistry—(2); Comparative Anatomy—(4); Physics: Electricity, Magnetism, and Meteorology—(2); Political Economy—(3); Dissertations.

SENIOR YEAR.

FIRST TERM.

Agricultural Chemistry—(2); Veterinary Science: Anatomy and Physiology—(3); Geology and Mineralogy—(5); Psychology—(5); Dissertations.

SECOND TERM.

Veterinary Science: Physiology, Disease, Treatment, and Medicine—(4); Lectures on Foods—(1); Philosophy of Science and Sociology—(5); Science of Language—(5); Preparation of Thesis.

THE COURSE IN MECHANICAL ENGINEERING.

SPECIAL FACULTY.

THE PRESIDENT.

Professors THOMSON (Dean),
STANTON,
BEAL,

MACOMBER,
MISS SINCLAIR.

PURPOSE.

The object of this course is to impart the scientific knowledge and practical skill which are essential to success in mechanical engineering.

*Optional to students who have an average standing of 3.75 in studies of the first term, Sophomore year.

This necessarily implies a thorough mastery of the principles of mathematics and a diligent study of their application to the construction of machines. In addition to the technical instruction given, it aims to furnish the means for obtaining a liberal and practical education.

COURSE OF STUDY.

It embraces the required antecedent studies of the first year and a half; also, a few general branches in the Junior and Senior years, and the entire technical course of study and practice necessary to the master workman.

GRADUATION.

To graduate in Mechanical Engineering requires a standing of at least three (four being perfect) in all the studies of the following lists and the presentation of a final thesis.

COURSE OF STUDY.

FRESHMAN YEAR.

FIRST TERM.

Practical Mechanics—(2); Advanced Algebra—(5), fourteen weeks; Geometry begun—(5), four weeks; Book-keeping—(3); *Rhetoric*—(3), or *German*—(5), or *Latin*—(5); Drawing—(3); Composition—(1).

SECOND TERM.

Practical Mechanics—(2); Geometry—(5); Elementary Botany—(2); Descriptive Zoology—(2); *Peabody's Moral Science*—(3), or *Latin*—(5), or *German*—(5); Drawing—(3); Composition—(1).

SOPHOMORE YEAR.

FIRST TERM.

Plane Trigonometry—(5), nine weeks; Land Surveying—(5), nine weeks; Physics: Mechanics of Solids, Liquids, and Gases—(2); General Chemistry—(3); Systematic Botany—(2); General Zoology—(2).

SECOND TERM.

Analytical Geometry—(5); Descriptive Geometry—(2); Spherical Trigonometry—(1); Physics: Light and Sound—(3); General Chemistry—(2).

JUNIOR YEAR.

FIRST TERM.

Principles of Mechanism—(5), twelve weeks; Analytical Mechanics—(5), six weeks; Stereotomy—(2), ten weeks; Shades, Shadows, and Perspective—(2), eight weeks; Model Drawing—(2); Differential and Integral Calculus—(5); Physics: Heat—(3).

SECOND TERM.

Theoretical and Applied Mechanics—(5); Physics: Electricity, Magnetism, and Meteorology—(2); Political Economy—(3); French—(5); Dissertations.

SENIOR YEAR.

FIRST TERM

Principles of Mechanism—(5); Theory of Motors—(5), nine weeks; Mechanical Drawing—(2); French—(5); Psychology—(5); *Geology and Mineralogy*—(5); Dissertations.

SECOND TERM.

Prime Movers—(5); Mechanical Designing—(2); Philosophy of Science and Sociology—(5); French—(5); Preparation of Thesis.

THE COURSE IN CIVIL ENGINEERING.

SPECIAL FACULTY.

THE PRESIDENT.

Professors BEAL (Dean),
MOUNT,
STANTON,

THOMSON,
MACOMBER,
MISS SINCLAIR.

PURPOSE.

It is the object of this course to educate and thoroughly train the student for the work of the Civil Engineer. It furnishes a thorough and practical course of instruction in the application of the mathematical and physical sciences to the profession of Civil Engineering. It is necessarily based upon a systematic drill in pure mathematics and includes in common with the other courses the studies necessary to a liberal education.

COURSE OF STUDY.

The course of study embraces the antecedent studies of the first three terms and a limited number of general branches in the last two years. It comprises a full course of technical study and practice preparatory to Civil Engineering.

GRADUATION.

A standing of at least three (four being perfect) in all the studies of the course, and a final thesis, are the conditions of graduation.

COURSE OF STUDY.

FRESHMAN YEAR.

FIRST TERM.

Practical Mechanics—(2); Advanced Algebra—(5) fourteen weeks; Geometry begun—(5) four weeks; Book-keeping—(3); *Rhetoric*—(3), or *German*—(5), or *Latin*—(5); Drawing—(2); Composition—(1).

SECOND TERM.

Practical Mechanics—(2); Geometry—(5); Elementary Botany—(2); Descriptive Zoology—(2); *Peabody's Moral Science*—(3), or *Latin*—(5), or *German*—(5); Drawing—(2); Composition—(1).

SOPHOMORE YEAR.

FIRST TERM.

Plane Trigonometry—(5) nine weeks; Land Surveying—(5) nine weeks; Physics: Mechanics of Solids, Liquids, and Gases—(2); General Chemistry—(3); Systematic Botany—(2); General Zoology—(2).

SECOND TERM.

Analytical Geometry—(5); Descriptive Geometry—(2); Spherical Trigonometry—(1); Physics: Light and Sound—(3); General Chemistry—(2).

JUNIOR YEAR.

FIRST TERM.

Railroad Surveying—(5) twelve weeks; Analytical Mechanics—(5) six weeks; Stereotomy—(2) ten weeks; Shades, Shadows, and Perspective—(2) eight weeks; Model Drawing—(2); Differential and Integral Calculus—(5); Physics: Heat—(3).

SECOND TERM.

Theoretical and Applied Mechanics—(5); Astronomy—(2); Political Economy—(3); French—(5); Dissertations.

SENIOR YEAR.

FIRST TERM.

Roof and Bridge Structures—(5); Geology and Mineralogy—(5); Psychology—(5); French—(5); Dissertations.

SECOND TERM.

Roof and Bridge Structures—(5); Designing—(2); Philosophy of Science and Sociology—(5); French—(5); Preparation of Thesis.

THE LADIES' COURSE IN SCIENCE.

SPECIAL FACULTY.

THE PRESIDENT.

MRS. WELCH (Dean).
MISS SINCLAIR,
Professors GEDDES,
.WYNN,

POPE,
BESSEY,
MACOMBER,
STANTON.

PURPOSE.

The studies comprised in the ladies' course have been selected with reference simply to their value, as pre-requisites to a thoroughly practical education, embracing a well balanced variety of subjects. This course is designed to confer a culture that is at once solid and available.

COURSE OF STUDY.

It is composed of the antecedent studies of the first three terms, the most approved branches of science and literature in the last five terms, and the study and practice required for systematic house-keeping.

GRADUATION.

A standing of at least three (four being perfect) and a final thesis as required by College law, are the conditions of graduation in this course.

COURSE OF STUDY.

FRESHMAN YEAR.

FIRST TERM.

Advanced Algebra—(5) fourteen weeks; Geometry begun—(5) four weeks; Book-keeping—(3); *Rhetoric*—(3), or *Latin*—(5), or *German*—(5); Drawing—(3); Composition—(1).

SECOND TERM.

Elementary Botany—(2); Descriptive Zoology—(2); Geometry—(5); *Peabody's Moral Science*—(3), or *Latin*—(5), or *German*—(5); Drawing—(3); Composition—(1).

SOPHOMORE YEAR.

FIRST TERM.

* *Plane Trigonometry*—(5) nine weeks; History—(2) nine weeks; Systematic Botany—(2); General Chemistry—(3); Domestic Economy—(2); General Zoology—(2); Physics: Mechanics of Solids, Liquids, and Gases—(2).

SECOND TERM.

Economic Botany—(2); *General Chemistry*—(2), or *Analytical Geometry*—(5); Entomology and Vertebrate Zoology—(5); Physics: Light and Sound—(3).

JUNIOR YEAR.

FIRST TERM.

Vegetable Physiology—(4) eleven weeks; Cryptogamic Botany—(4) seven weeks; Physics: Heat—(3); English Literature—(5); *Quantitative Chemistry*—(2), or *Differential and Integral Calculus*—(5).

SECOND TERM.

Domestic Economy—(1); Domestic Chemistry—(1); French—(5); Comparative Anatomy—(4); *Landscape Gardening*—(3) or *Physics: Electricity, Magnetism, and Meteorology*—(2); Political Economy—(3); Dissertations.

SENIOR YEAR.

FIRST TERM.

French—(3); Geology and Mineralogy—(5); Psychology—(5); Dissertations.

SECOND TERM.

French—(5); Philosophy of Science and Sociology—(5); Science of Language—(5); Preparation of Thesis.

* Optional with History and Domestic Economy to those desiring to take Analytical Geometry and Calculus, or the special course in Mathematics and Physics.

PRELIMINARY COURSE.

(FOR SUB-FRESHMEN.)

INSTRUCTORS.

MR. T. L. SMITH.
MR. C. F. MOUNT.

MISS SINCLAIR.
MRS. WELCH.

COURSE OF STUDY.

FIRST TERM.

Higher Arithmetic—(5) six weeks; Algebra, begun—(5) ten weeks; English Analysis—(5); Physiology and Hygiene—(2); Drawing—(2).

SECOND TERM.

Algebra—(5) eight weeks; Geometry, begun—(5) eight weeks; History—(5); Physiology and Hygiene—(3); *Descriptive Zoology—(2); Drawing—(2).

THE COURSE FOR JUNIORS AND SENIORS IN SPECIAL INDUSTRIAL SCIENCES.

For the purpose of enabling students of the Junior and Senior classes in the Agricultural College, to attain a high degree of proficiency in a branch of industrial science or art, the Faculty permit a choice of some single study and the omission of others, as given below. It is understood that the student will devote double the usual time to the study so chosen.

No permission will be given to specialize in literary studies; neither will a student who chooses special studies be permitted to take any optional ones of the regular course.

* To be taken by those who have passed Physiology and Hygiene.

The special student in Chemistry may omit,

Junior Year—*First Term* —Botany or Physics.

Second Term—Comparative Anatomy, or Physics, or Landscape Engineering.

Senior Year—*First Term* —Geology or Veterinary Science.

Second Term—Veterinary Science or Science of Language.

The special student in Botany may omit,

Junior Year—*First Term* —Chemistry, or Physics.

Second Term—Chemistry or Physics, or Comparative Anatomy.

Senior Year—*First Term* —Geology or Veterinary Science.

Second Term—Veterinary Science or Science of Language.

The special student in Zoology may omit,

Junior Year—*First Term* —Chemistry or Physics.

Second Term—Chemistry, or Physics, and French.

Senior Year—*First Term* —Geology, or Veterinary Science and French.

Second Term—Veterinary Science and French.

The special student in Physics may omit,

Senior Year—*First Term* —Geology, or Veterinary Science, or Agricultural Chemistry.

Second Term—Veterinary Science or Science of Language.

The special student in Agriculture may omit,

Junior Year—*First Term* —Physics or English Literature.

Second Term—Physics.

Senior Year—*First Term* —Geology.

Second Term—Science of Language.

The special student in Horticulture may omit,

Junior Year—*First Term* —Physics or English Literature.

Second Term—Physics.

Senior Year—*First Term* —Geology.

Second Term—Science of Language.

The special student in Geology may omit,

Senior Year—*First Term* —Veterinary Science.

Second Term—Veterinary Science.

The special student in Mathematics and Physics may omit,

Soph. Year —*Second Term*—Botany or Zoology.

Junior Year—*First Term* —Chemistry or Botany.

Second Term—Comparative Anatomy, or Chemistry and Landscape Engineering.

Senior Year—*First Term* —Geology, or Veterinary Science, or Agricultural Chemistry.

Second Term—Veterinary Science, or Science of Language.

The student in Architecture* may omit,

Junior Year—*First Term* —Principles of Mechanism.

Second Term—Mechanical Drawing.

Senior Year—*First Term* —Principles of Mechanism, Theory of Motors, Mechanical Drawing.

Second Term—Prime Movers, Mechanical Designing.

THE POST-GRADUATE COURSES OF STUDY.

At a meeting of the Board of Trustees, held in December, 1876, authority was given the Faculty to establish post-graduate courses of study and to confer upon those who should pass said courses a second degree. The Faculty have therefore arranged a carefully considered programme of post-graduate studies. All students desiring to secure a second degree must pursue a course of scientific study embracing two or more subjects selected from this programme and approved by the Faculty. At least one year will be required to complete the course. (*See Conditions for Conferring Second Degrees.*)

The following Professors will instruct and examine candidates for second degrees in post-graduate courses, as follows:

PRESIDENT WELCH,	1—Psychology.
	2—The Philosophy of Science.
	3—Social Science.
PROFESSOR WYNN,	4—The English Literature of the Elizabethan Period.
	5—Science of Language.
PROFESSOR BESSEY,	6—Physiological Botany.
	7—Systematic Botany.
PROFESSOR BEAL,	8—Special Zoology.
	9—Original Designs of Engineering Structures.
PROFESSOR STALKER,	10—Veterinary Pathology and Materia Medica.
	11—Principles of Breeding.
PROFESSOR THOMPSON,	12—Applied Mechanics.
PROFESSOR POPE,	13—Agricultural and Organic Chemistry.

* See School of Mechanical Engineering and Architecture.

PROFESSOR MACOMBER, 14—Advanced Physics.

PROFESSOR STANTON, 15—Analytical Geometry and Calculus.

PROFESSOR BUDD, 16—Horticulture and Forestry.

MIXED OPTIONAL COURSES AND THE COLLEGIATE CERTIFICATE.

Students who have passed all the studies of the College courses up to the end of the second term of the Sophomore year, may thereafter choose, in each term, such studies of that term found in any of the College courses as they may desire to pursue; provided that previous to their classification they file with the President a written declaration of their intention not to seek for a diploma of the College; and in no case shall such be classified in less than the equivalent of two full studies.

Any person of the requisite age and preparation who may desire to pursue any particular line of study included in the College curriculum will, upon application to the President, be allowed the advantages of the College classes and all other facilities afforded by the institution.

Students having successfully pursued a course of study in the institution composed of studies in advance of the first term of the Sophomore year, but not such a course as to entitle them to graduation will, upon application to the Faculty, be granted a certificate of standings in such studies.

DISSERTATIONS IN THE JUNIOR AND SENIOR YEARS.

Students in the Junior and Senior classes shall, during the first term of the Senior and the last term of the Junior year, write two dissertations each, on some topic approved by Special Faculty and embraced in the studies they are pursuing, and which shall be approved by the Professor having charge of such study.

Such Professor shall have supervision of the entire dissertation so written, being the sole judge of its fitness for delivery, and shall report its completion to the President.

Four such dissertations, with the final thesis, will be requisite to graduation.

DEGREES.

The degree of B. S., Bachelor of Science, is conferred upon graduates in the course in Sciences related to Agriculture.

The degree of B. C. E., Bachelor of Civil Engineering, is conferred upon graduates in the course in Civil Engineering.

The degree of B. M. E., Bachelor of Mechanical Engineering, is conferred upon graduates in the course in Mechanical Engineering.

The degree of B. S., Bachelor of Science, is conferred upon graduates in the Ladies' Course.

THE GRADUATING THESIS.

Every candidate for graduation shall present an acceptable thesis upon some subject approved by the Special Faculty in whose department he proposes to graduate.

The topic must be selected before the close of the first term of the Senior year, and the completed thesis must be presented to the Special Faculty one month before Commencement day.

Every thesis must be neatly written upon unruled paper, of a size designated by the Faculty; after an acceptance and formal reading, it shall become the property of the College, and shall be deposited in the library.

Ten theses shall be designated for public reading on Commencement day, each Special Faculty selecting its quota, the basis of such selection being [*a*] the value of the thesis, [*b*] scholarship in the course of study pursued, and [*c*] student's good conduct during his stay in College; the remaining theses shall be read before an open session of the Trustees and Faculty of the College.

Each thesis will be in the special charge of the Professor giving instruction in the branch of learning upon which it treats, and such Professor will be responsible to the Faculty for its supervision and correction.

CONDITIONS ON WHICH HIGHER DEGREES ARE CONFERRED.

These degrees are conferred upon candidates recommended by the Faculty, in conformity with the following rule:

1. The degree of Master of Science is open to Bachelors of Science who are graduates of either the course in Sciences related to Agriculture, or the Ladies' Course of this College.
2. The degree of Civil Engineer, is open to Bachelors of Civil En-

gineering, and Bachelors of Science, previous to 1878, who are graduates of the Civil Engineering course of this College.

3. The degree of Mechanical Engineer, is open to Bachelors of Mechanical Engineering, and Bachelors of Science previous to 1878, who are graduates of the Mechanical Engineering course of this College.

4. The degree of Master of Philosophy is open to graduates of either of the courses of study of this College.

5. The Faculty will recommend for the degree of Master of Science, candidates otherwise qualified, who, after taking their Bachelor's Degree, shall reside at the College for at least one year and pursue, during that time, a course of scientific study embracing at least two subjects selected with the approval of the faculty from the programme of post-graduate studies; and shall pass a thorough examination upon that course, showing in one of the subjects special attainments, and shall present a satisfactory thesis.

6. The Faculty will recommend for the degree of Civil Engineer, candidates otherwise qualified, who, after taking their Bachelor's degree, shall reside at the College for at least one year, and pursue during that time a course of study in Civil Engineering, and at least one additional subject, selected with the approval of the Faculty, from the subjoined programme of post-graduate studies; and shall pass a thorough examination upon that course, showing in one of the subjects special attainments, and shall also present a satisfactory thesis.

7. The Faculty will recommend for the degree of Mechanical Engineer, candidates otherwise qualified, who, after taking their Bachelor's degree, shall reside at the College for at least one year, and pursue during that time a course of study in Mechanical Engineering, and at least one additional subject, selected with the approval of the Faculty, from the subjoined programme of post-graduate studies; and shall pass a thorough examination upon that course, showing in one of the subjects special attainments, and shall also present a satisfactory thesis.

8. The Faculty will recommend for the degree of Master of Philosophy, candidates otherwise qualified, who, after taking their Bachelor's degree, shall reside at the College for at least one year, and pursue during that time a course of study embracing at least two studies selected with the approval of the Faculty, of which Science of Language, Psychology, Social Science, or higher Mathematics shall constitute the principal subject; and shall pass a thorough examina-

tion upon that course, showing in the principal subject chosen special attainments, and shall also present a satisfactory thesis.

9. These degrees may be respectively conferred upon Bachelors of Science, Bachelors of Civil Engineering, Bachelors of Mechanical Engineering graduates of this College who have not resided here since graduation who at a date not earlier than three years after graduation shall pass a thorough examination and present a thesis, as in case of residence.

10. Every resident graduate must apply in writing for examination at least six weeks previous to the annual meeting of the Board of Trustees, stating explicitly the studies in which he desires to be examined, and, at the time of examination (which may be four weeks previous to the meeting of the Board), he must present to the Faculty his final thesis.

11. Every non-resident candidate must notify the Faculty of his candidature in writing, at least six months previous to the annual meeting of the Board of Trustees, stating explicitly his present qualifications, and the course of study which he intends to offer; he must, also, six weeks previous to the annual meeting of the Board, apply in writing for examination, stating explicitly the studies in which he desires to be examined, and at the time of examination (which may be four weeks previous to the meeting of the Board), he must present to the Faculty his final thesis.

12. The fee for these degrees is five dollars.

SCHOOLS.

Subjoined is an explicit description of the special schools into which for greater convenience the College is divided. Any student who desires it is permitted to pursue exclusively the studies of any single school.

SCHOOL OF AGRICULTURE.

PROF. KNAPP.

PURPOSE.

The purpose of this course is to furnish instruction in the details of farm-work, in practical processes, in farm management, and such knowledge of the underlying sciences as will enable the student to become an intelligent agriculturist.

COURSE OF STUDY.

The course extends over two years, and includes the practical instruction in Agriculture and Horticulture, with some of the more closely related sciences from the general college course, and in addition a special course of lectures designed for this class.

FIRST YEAR.

FIRST TERM.

Practical Agriculture (4); Book-keeping (3); Horticulture (1); Veterinary Science (5).

SECOND TERM.

Horticulture (2); Botany (2); Animal Physiology (2); Stock-Breeding (1); Veterinary Science (5).

SECOND YEAR.

FIRST TERM.

Chemistry (3); Zoology (2); Systematic Botany (2); Veterinary Science (5).

SECOND TERM.

Economic Botany (2); Chemistry (2); Entomology and Zoology (5); Horticulture (2).

In addition to the class-room work, students will assist in conducting farm experiments, and engage in all the out-door operations of an instructive character.

A certificate of attendance will be given on the completion of the course.

SCHOOL OF HORTICULTURE.

PROF. BUDD.

This school forms a part of the regular collegiate course. Singly and alone the time allotted to this technical line of study and practice could accomplish little more than to make the student familiar with some of the leading modes and methods of empirical gardening, considered mainly as a mere art. Supported, however, by the full course in the natural sciences, the routine of Horticultural operations rises above the level of unreasoning custom to the rank of *applied science*. The cultivated plant becomes a thing of life, varied in vitality, habit of growth, and fruitfulness by conditions of soil and air more or less under control.

FRESHMAN YEAR.

The course begins with the second term of the Freshman year. Barry's "Fruit Garden" is used as a text-book, in connection with seasonable lectures, object lessons, and practice. In connection the lectures by Prof. Bessey on Elementary Botany and Vegetable Physiology prove important aids.

SOPHOMORE YEAR.

During the second term of this year the course of study includes the propagation and field management of shrubs, evergreens, flower-

ing plants, forestry trees, garden plants, etc. In the study of Forestry, Bryant's "Forest Trees" will be used as a text-book. The course during this year will be supported by instruction in Botany, Chemistry, Physics, Entomology, and Vegetable Biology.

JUNIOR YEAR.

During the first term lectures will be given on all the leading topics of Theoretical Horticulture. As supported by the course in Vegetable Physiology and Cryptogamic Botany, the student will be enabled to comprehend vitally important principles pertaining to vital force, germination, root and stem growth, leaf formation and function, climatic adaptation, etc.: intimately associated in our climate with perfect failure or varied degrees of success in all Horticultural operations.

THE MEANS FOR PRACTICAL ILLUSTRATION.

1. The Extensive Vegetable Gardens.
2. The Extended and Varied Flower Borders.
3. The Ornamental Grounds.
4. The Extended and Varied Experimental Nurseries.
5. The Extensive Experimental Orchards.
6. The Small-fruit Plantations.
7. The Forestry Plantations.
8. The Propagating Rooms.
9. The Propagating Pits Under Glass.
10. The Collection of Native and Cultivated Woods.
11. The Collections of Injurious and Beneficial Insects.
12. The Sets of Abnormal and Diseased Growths.
13. A Set of fac-simile Fruit Casts.
14. The Horticultural Museum now accumulating.

SCHOOL OF VETERINARY SCIENCE.

It is the purpose of this school to train students for practice in the veterinary specialty of medicine. The vast proportions of the stock interest in the West, the enormous losses that are being sustained from sporadic and contagious forms of disease among domestic animals, and the low standard of veterinary knowledge existing throughout the

country, rendered the establishment of such a school an imperative necessity. There is a wide and increasing demand for thoroughly trained veterinary practitioners, and no field for the exercise of skill and ability has been left so entirely unoccupied or offers stronger inducements.

The want of proper facilities for study in this department of medical science has necessarily kept the profession far below the position it occupies in European countries. But the extent to which some of our important material interests are threatened by epizootic diseases, has awakened public sentiment to the importance of providing for that sort of instruction that shall be of value in the prevention and treatment of such diseases. A course of study has been adopted that is in no way inferior to those of the best English or American Colleges. The departments of instruction are well provided for and the facilities are good. These will be especially referred to under the several departments.

The school has some

WANTS.

the most important of which is a building, that should cost not less than \$4,000 or \$5,000, to be used as a hospital, and provided with pharmacy office, operating room, and the proper appliances for instruction and experimentation.

FACULTY.

- A. S. WELCH, LL. D., PRESIDENT,
And Lecturer on Hereditary and Inherited Diseases.
- M. STALKER, B. S., V. S.,
Dean of the Faculty and Professor of Anatomy, Veterinary Medicine and Surgery.
- D. S. FAIRCHILD, M. D.,
Professor of Histology, Pathology and Therapeutics.
- C. E. BESSEY, M. S., Ph. D.,
Professor of Botany and Materia Medica.
- F. E. L. BEAL, B. S.,
Professor of Zoology and Comparative Anatomy.
- T. E. POPE, M. A.,
Professor of Chemistry and Toxicology.

COURSE OF STUDY.

JUNIOR YEAR.

FIRST TERM.

Botany—(2); Chemistry—(3); Zoology—(2); Anatomy of Domestic Animals—(5); Dissection; Clinics.

SECOND TERM.

Botany—(2); Materia Medica—(2); Comparative Anatomy—(4); Chemistry—(2); Anatomy of Domestic Animals—(5); Dissection; Clinics.

SENIOR YEAR.

FIRST TERM.

Veterinary Medicine and Surgery—(5); Organic Chemistry and Toxicology—(2); Materia Medica—(4); Histology and Physiology—(3); Therapeutics—(2); Dissection; Clinics.

SECOND TERM.

Veterinary Medicine and Surgery—(5); Comparative Pathology—(3); Therapeutics—(2); Heredity and Inherited Diseases; Dissection; Clinics.

ANATOMY OF DOMESTIC ANIMALS.

In this course the anatomy of the horse will be the special object of study, but important structural differences of other domestic animals will be carefully noted. The lectures on anatomy will be illustrated by means of plates, models, skeletons, and prepared specimens of all the organs. A convenient and well-furnished dissecting-room affords the student every facility for this important part of anatomical work. All dissections will be personally superintended by the Professor in charge, or by the demonstrator; and each student will be required to make a prescribed number of dissections before he can be eligible for final examination. The course will include one lecture each day during the Junior year.

ZOOLOGY AND COMPARATIVE ANATOMY.

The study of Zoology is carried through the first year with five recitations per week. The first term is devoted to the principles of classification and the study of the true relations of the different branches of the animal kingdom, with a discussion of some of the most important

physiological functions of animals. The second term is devoted to the more special consideration of the different species, paying particular attention to those having an economic interest. The work in the classroom is supplemented by practice in the laboratory where the specimens are studied and identified. In addition to this, each student is required to make a collection in some branch of Zoology which he may select.

The study of Comparative Anatomy is taken up in the second term of the second year and occupies four lectures per week throughout the term. The subjects treated are General Biology and Anatomy, the anatomy of the various organisms, the evolution of the different systems of organs, and comparative embryology. In addition to the lectures, each student spends one afternoon per week in the laboratory in the dissection and study of typical organisms.

HISTOLOGY.

This course embraces, 1st,—*Systemic Histology*. This section deals with the minute anatomy of the animal tissues, and this is taught systematically by lectures throughout the first term of the Senior year. 2d—*Functional Physiology*. This section refers to animal functions, and these are studied under the headings of (a) Nutrition, (b) Nervous, and (c) Reproduction. This section is taught in connection with the preceding and illustrated by diagrams, microscopical preparations, etc. 3d—*Practical Histology*. This includes the practical study of the various tissues of the animal body by the aid of the microscope. The various methods of preparing tissues for microscopic examination are taught with the object of familiarizing the eye of the student with the minute anatomy of all the tissues of the animal body. This study is prosecuted by the student under the immediate supervision of the Professor. The entire course in Histology includes about eighty lectures, and six hours laboratory work per week. The facilities in this department are excellent. The laboratory is a large, well-lighted room supplied with a large number of histological microscopes of the most approved stands, furnished with first-class objectives. There are also large stands with high powers for the more difficult work and for comparison.

GENERAL COMPARATIVE PATHOLOGY, PATHOLOGICAL ANATOMY, AND HISTOLOGY

embraces: 1st. The study of the Pathology, Prevention, etc., of the epizootic and general diseases of cattle, horses, sheep, pigs, dogs, and other domestic animals; the natural history and peculiarities of parasites with the affections to which they give rise, and the means to be adopted in preventing and destroying them. 2d. Pathological Anatomy and Histology. This course is full and complete. Pathological specimens of all kinds are brought before the class, and Pathological Histology is fully taught. Post-mortem examinations are frequently made in the presence of the class for the purpose of familiarizing the student with the appearance of diseased tissues. The relations of Pathological Histology to the principles of medicine and surgery are carefully treated of, and the advances made in the application of the microscope to exact pathology fully considered. The use of the microscope in the study of pathological specimens forms an important part of the laboratory work during the last term of the Senior year. The course in Pathology includes about eighty lectures.

HEREDITY.

A course of twenty lectures will be given during the first half of the fall term of the Senior year. The subjects treated will comprise transmissible qualities and characteristics; inherited traits and habits; the hereditary diseases, defects, mutilations, and descendible diseases, specially of horses and cattle; reversion; prepotence; in-breeding; crossing, and the production of races. The nature and treatment of lineal diseases will receive thorough attention.

INSTRUCTION IN BOTANY

extends through one year, the student devoting two exercises per week to this study during that time. In the spring term of his first year the student acquaints himself with general Botany, giving his attention to the identification of plants, and for this purpose he joins the class in Systematic Botany in the regular College course.

In the fall term the student takes up Economic Botany and *Materia Medica*, and the origin, preparation, and properties of the principal medicines derived from the vegetable kingdom are discussed and dwelt upon, and by means of carefully selected specimens, the student is made thoroughly familiar with their appearance.

During the year each student makes and preserves a collection of dried specimens of plants, and in this work he is required to devote particular attention to the native and cultivated plants which are of importance to the Veterinarian.

CHEMISTRY.

Junior Year, First Term—General Chemistry.

Junior Year, Second Term—Qualitative Analysis.

Senior Year, First Term—Quantitative Analysis; Physiological Chemistry.

Senior Year, Second Term—Quantitative Analysis; Physiological Chemistry.

General Chemistry embraces manipulating chemical apparatus, handling and making gases, studying the properties of different chemical elements and their compounds. In Qualitative Analysis, the students receive chemicals, minerals, etc., and determine the elements of which they are composed. The course is very thorough and no student can go on into the Senior year who is unable to analyze correctly inorganic substances. Writing chemical reactions and solving problems form an important part of the class work. There are three recitations a week during the first term, two in the second, and laboratory work two afternoons a week during each term.

In the Senior year students commence by analyzing quantitatively, pure chemicals, and, as soon as they have acquired sufficient skill, take up physiological work. This includes the detection of poisons; analyses of urine from healthy and diseased animals; examinations of food, including water; qualitative and quantitative analyses of the secretions in, and excrements from the body; together with such work as the clinical department may require. Students will also compound or make the medicines required by the school. During the second term original work is required, recitations twice a week during the year, laboratory work three afternoons during the first term and two in the second. A separate laboratory is devoted to this work. The desks are furnished with water, gas, and filter pumps. The required apparatus is furnished by the department and is very complete, embracing scales capable of weighing 1-20,000 of a gram, microscopes, combustion furnace, and miscellaneous apparatus to the amount of \$3,500 in value.

THERAPEUTICS.

The physiological and therapeutical value of medicines used in Veterinary practice, their properties, uses and doses, are carefully considered throughout the Senior year, and include about fifty lectures.

VETERINARY MEDICINE AND SURGERY.

This course embraces theoretical and practical instruction in the treatment of diseases to which all domestic animals are subject, as well as the theory and practice of surgery. The lectures will be illustrated from a valuable collection of specimens illustrative of the morbid anatomy as developed by a wide range of diseases. The students will have the benefit of assisting in a large practice, and those of the Senior class will be made familiar with the use of instruments and the administration of medicines. Several hundreds of animals, including horses, cattle, swine, and sheep, are kept on the College Farm, a large portion of which is breeding stock. Frequent inspection of these flocks and herds will afford the student most valuable opportunities for observing sanitary conditions, and gaining experience in obstetrical practice. The course will include one lecture each day during the Senior year, or about one hundred and eighty lectures. A collateral course of reading, embracing some of the best approved English works on the subjects taught, will be required.

CLINICS.

One half day each week will be devoted to the clinics held at the College hospital. The advanced students will be required to examine animals for certificates of soundness, diagnose diseases, and prescribe for the same. Hundreds of animals are presented at these examinations, for which medical or surgical advice is required; the student must exercise judgment as to the course of treatment to be pursued in these widely differing forms of disease.

CONDITIONS OF ADMISSION.

Candidates for admission must be at least sixteen years of age. Before entering the classes they must pass an examination in Reading, Orthography, Geography, English Grammar, and Arithmetic.

LENGTH OF COURSE.

The course occupies two years. Sessions begin the first of March and continue till the latter part of November, with a vacation of two weeks in July.

EXAMINATIONS.

At the close of each term, examinations will be given on the subjects taught during the term. These examinations will be final, with the exception of the following subjects: viz., anatomy, materia medica, therapeutics, and veterinary medicine and surgery. On the last named branches the student must pass a final examination at the end of his course. The method of examination will be largely under the control of the Professor in charge, but in every case will be such as to give ample proof as to the efficiency of the candidate.

CONDITIONS OF GRADUATION.

Candidates for graduation must be eighteen years of age; must have completed the entire course of study, and attained a standing of seventy-five per cent in all the studies pursued. Every candidate for graduation shall present an acceptable thesis upon some subject approved by the Faculty. A graduation fee of five dollars will be required.

SCHOOL OF DOMESTIC ECONOMY.

MRS. WELCH.

FRESHMAN YEAR.

SECOND TERM.

Elementary Botany and Animal Physiology.

SOPHOMORE YEAR.

FIRST TERM.

General Chemistry, Botany, Laundry Work, Plain Sewing, and Dress Making.

SECOND TERM.

General Chemistry and Botany.

JUNIOR YEAR.

FIRST TERM.

Botany and Vegetable Physiology

SECOND TERM.

Domestic Economy by lectures, Domestic Chemistry, Landscape Gardening, and Practice in Cookery.

The following is the course in Cookery. The lessons, twelve in number, are selected mainly from Miss Juliet Corson's Cooking-School Text-Book:

Lesson One.

Yeast, Biscuit, Milk Rolls, Breakfast Twist, Gold Cake, and Silver Cake.

Lesson Two.

Bread, Baked Macaroni, and Swiss Pudding with cream sauce.

Lesson Three.

Boiled Eggs, Poached Eggs, Fried Eggs, Omelette, Parsley Omelette, Sweet Omelette, and Apple Tarts.

Lesson Four.

Chicken Curry, Ragout of Beef, Broiled Steak, and Cassel Pudding with hard dressing.

Lesson Five.

Chicken Pie, Duchesse Potatoes, Julienne Potatoes, Kentucky Potatoes, and Fruit Cake.

Lesson Six.

Broiled Mutton Chops, Mutton Chops Sautee, Vegetables—general directions, Baked Turnips, Hot Slaw, and Pound Cake.

Lesson Seven.

Blanquette of Veal, Pork and Beans, and Sponge Cake.

Lesson Eight.

Roast Beef, Apple Pie, Cream Meringue Pie, Baked Apples, Apples and Rice, and Apple Custards.

Lesson Nine.

Stock, Caramel, Cream Cakes, and Chocolate.

Lesson Ten.

Clear Soup, Pea Soup, and Lemon Pie.

Lesson Eleven.

Mulligatawny Soup, Roast Turkey, "Angel's Food," and Tea.

Lesson Twelve.

Fried Oysters, Oyster Soup, Escaloped Oysters, and Coffee.

The first instruction in this department was given in 1872, by a course of lectures to the Junior ladies on matters connected with housekeeping. In 1877 the Trustees added a course in Cookery, and provided and furnished a kitchen for the use of the class. For the last two years, therefore, lessons in plain cooking have been given to the Junior ladies, together with lectures on such topics as "House Furnishing," "Care of the Sick," "Management of Help," "Care of Children," "Dress," etc., etc. Domestic Chemistry also forms a part of the course in Domestic Economy.

Our facilities were still further increased last spring by the addition of a laundry, wherein the ladies of the Sophomore class learn to wash and iron. During March and April two afternoons a week are spent in this laundry, under the careful supervision of competent teachers. During May and June lessons are given twice a week in plain sewing, the use of sewing-machines, and dress-making. From the first of August to the last of October the class is instructed in Cookery. Each student is required to do the work explained in every lesson, so that when the course is finished she will have cooked every article described.

SCHOOL OF MILITARY SCIENCE.

GENERAL GEDDES.

FIRST YEAR.

First Term —School of the Soldier.

Second Term—School of the Company.

SECOND YEAR.

First Term —School of the Battalion.

Second Term—Field Artillery Drill.

THIRD YEAR.

First Term —Broad-Sword Exercise and Artillery Drill.

Second Term—Small-Sword Exercise.

FOURTH YEAR.

First Term —Cavalry Drill and Small-Sword Exercise.

Lectures on Military subjects will be delivered throughout the course.

All male students of the College, except such as may be excused by proper authority, are required to wear the prescribed uniform, attend all military exercises in their respective classes, and become members of the College Battalion. The College uniform is made of good serviceable cloth and is furnished at cost, the price not exceeding fourteen dollars.

SCHOOL OF LITERATURE AND LANGUAGE.

PROF. WYNN AND MISS SINCLAIR.

The literary course opens with Rhetoric as a full study in the first term of the Freshman year. It is made optional with Latin and German; the Rhetoric being finished up with the first term; Latin and German continuing throughout the Freshman year. The design is, with the aid of the most competent text-book we can find, to require as much original work in grammatical purity, principles, choice, and use of words, kinds of composition, etc., as the time of the classes will permit. No pains are spared to illustrate the main excellencies of style in the works of the great masters who have written in the mother tongue, and in this way to make this study a fitting preparation for English Literature which is to follow.

A course in History has been planned for the Ladies' course in the Sophomore first term. The aim here will be, instead of running over Universal History in a dry text-book fashion, to take hold of some fruitful epoch in the ages, and develop it, the student furnishing the result of his own researches along a line of references indicated in the lecture-room.

The first term of the Junior Year is occupied with English Literature proper. It is a full study and open to all courses except the Mechanical and Civil Engineering. As there is but one term devoted to this, and it is impossible in so brief a space to become familiar with the whole history of the English mind, from the days of the Anglo-Saxon Conquest down to the present time, a similar method will be pursued here as in Universal History—some specially productive era being selected, and the student required, under the guide of an outline furnished in the lecture-room, to sum up investigations of his own in the literary, social, and religious influences prevailing at that time and giving character to the great master-pieces which were then produced. At this stage of the student's progress, the library becomes his laboratory, and care will be taken that the necessary books of reference will be furnished to his hand.

The literary course closes with the Science of Language in the second term of the Senior year. Here the student, keeping in the main close to some competent text-book, seeks to discover the underlying laws of language, making that subtle instrument, which is to be his means of conveying his intellectual life and power to his fellows, the object of his study, with the view to determining the origin, history, growth, decay, and ethnic relations of all the languages on the face of the earth, and settling, in so far as that may be done, the relation of language to thought. As leading out to psychology in one direction, to ethnology in another, and to comparative mythology in another, it is replete with interest, and has a fascination that entitles it to a crowning place in the course.

LATIN.

One year's course in Latin is provided—a full study during the first and second terms of the Freshman year. The design is simply to meet the practical necessities of the scientific curriculum that prevails here. A brief preparatory drill introduces the student to Cæsar; after reading carefully two books, he enters Virgil's *Æneid* and continues in it to the end of the year. The Roman pronunciation is adopted.

Allen & Greenough's text-books are used, and the most advanced methods of imparting instruction are diligently sought for and practiced.

FRENCH AND GERMAN.

In the present course each of these languages is regarded as a means to an end, and not as an end in itself. Each is therefore pursued as an art rather than a science, and consequently the natural or empirical method of instruction has a more prominent place than the scientific. By combining the two methods in this manner, better practical results are obtained than would be possible in the same time by following either method exclusively. In the study of either French or German the students are expected, from the beginning, to use the language in the class-room as far as possible.

The study of German has been introduced as optional with Latin and Rhetoric in the Freshman year. It is not claimed that anything but a rudimental knowledge of the language can be acquired in the allotted time, but special effort is made to render this knowledge practical and to make it the basis for future attainment. An energetic and persevering student gains by one year's thorough application, a knowledge of German which, though limited, may still be of great practical use. Otto's Conversation Grammar is used as a text-book during the first term.

The course in French occupies the last three terms of the courses in Mechanical and Civil Engineering and the Ladies' Course. The chief object in view is not an exhaustive and critical knowledge of the grammar of the language, but as high a degree of its practical mastery as is attainable in the time. Much time is therefore given to reading, in order to familiarize the student with different styles of writing and to give facility in translating. In both French and German the much neglected art of understanding the spoken language receives particular attention. For acquiring the necessary knowledge of inflections and for reference, Keetel's Collegiate French Course is used.

SCHOOL OF MATHEMATICS AND PHYSICS.

PROFS. STANTON AND MACOMBER.

The course of instruction in Pure Mathematics pre-supposes a thorough knowledge of Arithmetic and the elementary principles of Algebra. It occupies three years for its completion, and embraces:

FRESHMAN YEAR.—First term—Algebra, Loomis' Treatise; second term—Plane, Solid, and Spherical Geometry, Loomis.

SOPHOMORE YEAR.—First term—Trigonometry, Chauvenet; second term—Analytical Geometry, Church.

JUNIOR YEAR.—First term—Differential and Integral Calculus, Buckingham; second term—Calculus and Philosophy of Mathematics.

During the Freshman year the studies of this department are common to all the College courses. Trigonometry is required of ladies desiring to pursue higher mathematics; it is a regular study in the other courses. Analytical Geometry and Calculus are regular studies in both the Engineering courses, optional with Chemistry in the Ladies' course, and may be taken by such students in the Course in Sciences related to Agriculture as obtain an average standing of 3.75 in the studies of the first term of the Sophomore year. Advanced Calculus and the Philosophy of Mathematics are studied by students in the special course in Mathematics and Physics.

Algebra.—In algebra there will be two divisions. The first of these will be composed of students who show by their entrance examinations thoroughness in Arithmetic and a ready familiarity with the principles of Algebra through Equations of the First Degree; the other will include all students obtaining a high standing in Arithmetic and passing the required examination in Algebra, but show in this latter study a want of thoroughness. Particular attention will be given in this study to the explanation of the cardinal principles, and the drill in the solution of problems and equations will be conducted with reference to fixing these principles in the minds of the students. The first division will complete the subject in fourteen weeks; the other will devote to its study the entire term.

Geometry.—All students securing a standing of three (four being perfect) in either of the divisions in Algebra will be permitted to enter the class in Geometry. This class will be divided into two divisions, corresponding with those in Algebra. The first division will give to the study of Plane, Solid, and Spherical Geometry the last four weeks of the first, and all of the second term of the Freshman year, while the other division will devote to the same subject the eighteen weeks of the second term. In this class the student is early taught the full meaning of a Geometrical demonstration. He is warned against the danger of learning the proposition by rote; and in order that he may not fall into this error, is, at the end of the first book, assigned original theorems, which he is required to demonstrate. He is expected not only to thoroughly understand each proposition, but to be able to so arrange and present the points of the proof as to perform a complete and perfect demonstration.

Trigonometry.—Instruction is given in this branch during the first nine weeks of the first term of the Sophomore year, by Professor Beal. The class is thoroughly drilled in the nature and use of the Trigonometrical functions.

Analytical Geometry.—This study is pursued by the Sophomore class during the second term. The course of instruction embraces Determinate and Indeterminate Geometry, including a full examination of the Conic Sections. The underlying principles are brought prominently forward and discussed. The students are required to carefully analyze each article, and solve the problems connected therewith. To secure thoroughness frequent reviews are given.

Calculus.—Instruction in Calculus is given during the spring term of the Junior year. To enter this class it is necessary that the student should have *passed* the lower mathematical studies of the course. In no case can the study be pursued successfully without previous drill in Analytical Geometry. Buckingham's Calculus is used as a text-book. The abstruse principles of this method of mathematical investigation are explained upon the theory of *rates*, rather than upon the theory of *infinitesimals*. Instruction is given by daily recitations and lectures, with a review each Friday, of the week's work. Twelve weeks are devoted to Integral, and the remainder of the term to Differential Calculus.

Advanced Calculus and the Philosophy of Mathematics.—Students in the Special Course in Mathematics and Physics will continue the study of Calculus during a greater portion of the Junior year. A

large number of problems illustrating the different forms into which differentials must be thrown in order to obtain the integrals, will be solved. The object aimed at will be to make the student so familiar with the principles of the science and the methods of procedure as to enable him to apply the complicated machinery of Calculus to practical use. In the latter part of the term lectures will be given on the Philosophy of Mathematics.

PHYSICS.

Students commence this study in the Sophomore year and complete it at the close of the Junior year. The study is conducted by means of lectures, and recitations from the text-book, illustrated throughout by numerous experiments. During the first term of the Sophomore year a course of lectures on mechanics, the mechanical powers, and the laws of motion, is given. Also, the general subject of the Mechanics of solids, liquids, and gases, is studied from the text-book. Sound and Light are studied during the second term. Especial attention is given to Geometrical Optics and the theory of optical instruments. The first term of the Junior year is taken up in the study of Heat and Magnetism. Electricity and Meteorology complete the course during the last term. Especial attention is given to the later discoveries in Electricity and Magnetism. Dynamo-electric machines, the electric light, and all the more recent discoveries and applications of electricity are fully considered. The course is completed by a number of lectures on the recent advances in physical science, in which such topics as, The Conservation of Energy, The Correlation of the Physical Forces, The Theory of Machines, Relation of Vital to Physical Forces, and The Dissipation of Energy, are discussed.

‡ Liberal appropriations were early made for a Cabinet of physical apparatus, and as additions are made to it every year the department is tolerably well supplied with facilities for illustrating the more prominent subjects in Physics. Among other prominent pieces of apparatus might be mentioned a large imported Holtz electrical machine, with Geissler tubes and other apparatus necessary for illustrating the laws of frictional electricity; a fine scientific stereopticon for the Drummond light, and a large number of pictures for lecture work; one of Ritchie's best air pumps, with the necessary apparatus for experiments on Pneumatics; Melloni's apparatus for radiant heat; and other instruments for studying mechanics, optics, and sound, too numerous to attempt a mention of them. The original cost of the Cabinet amounts

to about four thousand five hundred dollars. Ganot's Physics is used as a text-book.

The Physical Laboratory is supplied with gas and water in abundance, and is heated by steam. The lecture room has its seats arranged so that a class of one hundred and fifty can see the experiments to the best advantage. An advanced course which occupies the Senior year, is offered to students who desire it. Such as choose this course are required to spend from two to three afternoons per week in the Laboratory. They will be occupied in advanced work in Optics, Electricity, and Magnetism, and will receive lectures on the elements of physical manipulations and methods of research.

SCHOOL OF CHEMISTRY.

PROF. POPE.

SOPHOMORE YEAR.—First term, General Chemistry; second term, Qualitative Analysis.

JUNIOR YEAR.—First term, Quantitative Analysis; second term, Quantitative Analysis, Organic Chemistry, the Ladies' Course in Domestic Chemistry, Lectures on Human Foods, etc.

SENIOR YEAR.—First term, Agricultural Chemistry; second term, Lectures on Foods for Domestic Animals.

General Chemistry embraces manipulating chemical apparatus, handling and making gases, studying the properties of different chemical elements and their compounds. In Qualitative Analysis the students receive chemicals, minerals, etc., and determine the elements of which they are composed. The course is very thorough, and no student can go on into the Junior year who is unable to analyze correctly inorganic substances. Writing chemical reactions and solving problems form an important part of the class work. Three recitations a week are held in the first term and two in the second—laboratory work two afternoons a week during the year.

In the Junior year students commence by analyzing, qualitatively, pure chemicals, and as soon as they have acquired sufficient skill analyze paints, alloys, minerals, cast iron, water, etc. The second term's work in the laboratory is a continuation of the first, and includes also organic analyses embracing such substances as hay, milk, uric acid, sugar, etc. The class work in the first term consists principally in working out methods of analyses suitable for compounds whose composition is given. During the second term organic chemistry is studied. Three afternoons a week are required for laboratory work during the first term and two during the second, but the laboratory is open all day and as each student has a separate desk he can spend as much extra time in the laboratory as his studies permit. The ladies' course during the first term is nearly the same, in the second they have one lecture a week on domestic chemistry.

In the Senior year, first term, lectures are given on agricultural chemistry, embracing such topics as chemistry of soils and plants, manures, forces, etc; second term, on foods for domestic animals.

In the special course in chemistry, students are permitted to drop one of the specified studies and devote twice the usual time to chemistry.

The laboratories cover a space of forty-five hundred square feet, have one hundred desks furnished with water and gas; those in the quantitative laboratory have filter pumps on each. The apparatus of this department is valued at thirty-five hundred dollars, and includes scales capable of weighing to one-twentieth of a milligramme, combustion furnace, microscope, spectroscope, etc.

The text-books used in the Sophomore year are Cooke's Chemical Philosophy, Snively's Tables for Systematic Qualitative Analysis; Junior year, Fresenius' Quantitative Analysis, Bloxam's Chemistry, Organic and Inorganic (the organic portion alone is studied); Senior year, lectures.

SCHOOL OF BIOLOGY.

PROFS. BESSEY AND BEAL.

BOTANY.

All students in the second term of the Freshman year begin the study of Elementary Botany. By means of lectures twice a week, with illustrations from fresh specimens, the student easily masters all the more important facts relating to the general or gross anatomy of plants.

During the first term of the Sophomore year the students in all the departments pursue the study of Systematic Botany. They are expected to analyze and classify a sufficient number of plants so as to familiarize themselves with the more important orders and the principles of classification. Each student is required to prepare not less than fifty herbarium specimens, which are submitted for examination at the end of the term.

The higher course in Botany begins with Economic Botany in the second term of the Sophomore year. The origin history and relationship of cultivated plants, together with a discussion of the value and relative importance of the timber trees of the world are taken up in a course of twenty-five lectures. Also the weeds of the farm and garden, with suggestions as to their eradication are discussed at some length, and the rudiments of Medical Botany are introduced as occasion demands.

In the first part of the Junior year, students who take the higher course in Botany pursue the study of Vegetable Anatomy and Physiology, reciting four hours a week from the text-book, and spending in addition one afternoon each week in the laboratory. About half the term is given to this study, and, if the student is faithful and earnest in his work, he cannot fail to obtain a fair knowledge of the structure and mode of growth and nutrition of plants, as understood by modern Vegetable Physiologists.

The remaining portion of the term is devoted to lectures upon Cryptogamic Botany, in which the student is familiarized with the structure

and principles of classification of the lower orders of plants. The lectures are supplemented by a course of laboratory work, which includes an examination of typical and other important forms. The parasitic Fungi are studied and dwelt upon to a considerable extent, in accordance with the growing idea of their importance in Agriculture, Horticulture, and the industrial arts.

The means of investigation throughout the course are: (1) the College Herbarium; (2) a collection of billets of various kinds of woods; (3) a collection of grasses; (4) a collection of cones of evergreens; (5) a set of diagrams and charts; (6) eleven compound microscopes (with Hartnack's, Tolles', and Beck's objectives); (7) alcoholic and dry material for examination in the Botanical Laboratory; (8) students also have access to the collections of mosses, lichens, and fungi belonging to the professor.

ZOOLOGY.

This course is begun in the second term of the Freshman year by the study of Descriptive Zoology in which are discussed the external form, outward relation, and geographical distribution of the various members of the animal kingdom. In the first term of the Sophomore year the general subject of Comparative Zoology is taken up, including the principles of classification and the true relations of the different parts of the animal creation, with a consideration of their more important physiological functions. The second term of this year is devoted to a special consideration of the different animals, more particularly those which possess an economic interest. Following this plan, the greater portion of the term is occupied with the subject of Entomology; special attention being paid to those insects which have proved injurious to the farmer and gardener. Their life-history, as far as known, is examined and the various remedies and checks that have been found efficacious are suggested. In addition to the classroom work of this year, each student is required to collect, prepare, and identify a certain number of specimens from some department of the animal kingdom. These specimens are then deposited in the museum. During the last term of the year, the student spends one afternoon (or three hours) of each week in the study and identification of specimens in the laboratory.

In the second term of the Junior year the study of Comparative Anatomy is taken up in a course of lectures extending through the whole term. The general and special facts of Biology and the ana-

tomical structure of the various organisms, are discussed with as much minuteness of detail as the time will admit, followed by a *resume* of the subject in which the evolution of the different systems of organs is traced from their earliest beginnings to their most differentiated forms. The whole is supplemented by a short course upon Embryology in which the development of the ovum is traced and compared with those forms already discussed. During this term the student spends one afternoon in each week in the laboratory in the dissection and study of typical forms of the animal phyla.

The library to which the students have access every day has a fair supply of books bearing upon these topics, among which are the following: "Harris' Insects"; Carpenter's "Comparative Physiology"; Owen's "Comparative Anatomy"; Gegenbaur's "Comparative Anatomy"; Huxley's "Anatomy of the Invertebrata," Darwin's "Origin of Species," "Descent of Man," and "Variation of Plants and Animals Under Domestication." Jordan's "Manual of the Vertebrates of North America" is used for identifying specimens.

Ample facilities will be afforded to students who may wish to pursue any special line of zoological or anatomical research.

The Museum occupies a large room on the third floor of the south wing of the main building. It includes mounted specimens of a few mammals; several hundred birds (mounted), representing the avian fauna of the state; a large collection of reptiles, in alcohol; a few fishes; and a small but typical collection of invertebrates. A set of the "Ward Models," illustrating the principal larger fossils, and a cabinet of mineralogical specimens, are of service in the study of Geology. There are, besides, the following collections in the process of formation: A seed collection; an entomological cabinet; sets of the eggs and nests of birds; the brains of vertebrates; skulls of mammals; and skeletons of vertebrates.

During the second term of the College year, the museum room is used as a laboratory, in which the students in Zoology make a direct study of the specimens. Tables and chairs enough to accommodate twenty students, at once, are provided, and the room is open three afternoons a week for work.

Visitors are admitted to the museum every afternoon from one to five o'clock.

SCHOOL OF PHILOSOPHY.

PRESIDENT WELCH, PROFS. WYNN AND STANTON.

FRESHMAN YEAR.—Second term, Moral Science.

JUNIOR YEAR.—Second Term, Political Economy.

SENIOR YEAR.—First term, Psychology; second term, Philosophy of Science, Sociology, and Science of Language.

MORAL SCIENCE.

The Freshman class engages in the study of Moral Science, reciting three days a week during the fall term. Peabody's Moral Science is used, and the subject is illustrated by abundant concrete examples.

POLITICAL ECONOMY.

In this division of Social Science are taught, by text-book, familiar lectures and discussion, the laws of labor—its products and their cost; the principles of capital, money, foreign trade, tariff, taxation, and all the influences that quicken or retard exchange. The student thus gains a thorough acquaintance with the scientific data that underly and regulate industry. He becomes intelligent, moreover, in all questions of public policy respecting which there is such a wide diversity of opinion.

PSYCHOLOGY.

In the study of Psychology we aim to avoid all those questions which the discussion of centuries has failed to solve, and which consequently have no bearing either on human conduct or a knowledge of human nature. The object sought by the student in this study is to gain a systematic acquaintance with the phenomena of thought, feeling, and volition; to get an insight, clear as may be, into the workings of his own mind, its modes of action, its limits, its means and order of growth from sense to reasoning. No real progress in Psychology can be made except through the revelations of consciousness. The student must attain the difficult art of rightly scrutinizing his own mental states and modes of thought. Six essays on topics chosen by the Pro-

fessor are written during the term by each member of the class. The facts of Psychology we may add are made the basis for the subsequent study of the Philosophy of Science and, together with the principles of Biology, are properly preparatory to Sociology. The library is well supplied with books of reference.

PHILOSOPHY OF SCIENCE.

This subject which occupies the Senior class the first half of the fall term is presented by lectures on the creation and classification of the sciences; methods of investigation, observation, experiment, and hypothesis; inductive and deductive reasoning; necessary and contingent truths; regressive reasoning illustrated by Geometry; limits of scientific knowledge, etc.

SOCIOLOGY.

The remaining portion of the Senior year is given to a rapid survey of the fundamental principles of Sociology. This survey will comprise the data of the science, namely, the feelings, ideas, and wants of man, the primitive condition of the human race—its superstitions, erroneous beliefs, and the impulses by which savage tribes struggled up into civilized nations. A brief account will also be given of the origin and growth of government, law, science, religion, industry, and art. The object sought is simply to lay the foundation for future acquisitions.

[For Science of Language see School of Literature and Language.]

SCHOOL OF MECHANICAL ENGINEERING AND ARCHITECTURE.

PROFS. THOMSON AND SMITH.

The College aims by the studies pursued in the School of Mechanical Engineering to lay a foundation of sound theory sufficiently comprehensive to enable its graduates to enter understandingly on the further investigations of the problems which may arise in the several depart-

ments of their professional work. It further aims to teach the student such skill and dexterity in the use of tools and machinery as to enable him not only to properly design, but also if necessary to construct, any machinery which the development of the mechanic arts may require; shop-practice is therefore included in the course. The workshop is fitted up with vises, tools, and machinery for the purpose of enabling the teacher to give instruction according to the most approved methods of modern practice. This work is carried through the Freshman and Junior years, and may be pursued in the Senior year in connection with designing and drawing. The leading studies are as follows:

Geometrical and Projection Drawing.—This is carried on with, and is subservient to, the work done in the shops.

Descriptive Geometry.—This subject is taught by the Professor of Civil Engineering, for which see Civil Engineering.

Principles of Mechanism.—Treats of mechanism in general; rolling contact; sliding contact; wrapping connectors; trains of elementary combinations; general principles of aggregate velocity; combinations for producing aggregate paths or motion in space; adjustments; properties of friction; butting friction; twisting friction; friction wheels; coil friction; universal joints.

Analytical Mechanics.—This subject is taught by the use of text-book and lectures, and embraces all the subjects which are deemed appropriate and profitable to the student in the Civil and Mechanical Engineering courses.

Resistance of Materials.—This embraces experimental work, and results found by other experimenters, from which are deduced the laws and coefficients of elasticity; work of elongation, and time of oscillation; set, viscosity, modulus of strength; safe limits of loading; tension and compression; strength of columns; shocks; crystallization and practical formulas.

Prime Movers.—The indicator as applied to the steam engine; the use of brakes and dynamometers; to proportion fly-wheels so that their velocity shall deviate from a mean velocity by a given amount; measurement of a source of water power; water power engines; water pressure engines; impulse of water on vanes; turbine water wheels; combustion of fuel, efficiency of furnace; principles of thermo-dynamics; air engines; steam engines; furnaces and boilers. The student is also required to take indicator diagrams, and from them calculate the power

of engines with steam working at different degrees of expansion, the diagrams being taken from different engines.

Machine Drawing.—Complete working and detailed drawings for use in the shops; drawings of original designs; finished in water colors and by line shading; designs and estimates for machinery.

ARCHITECTURE.

Architecture is now a branch of the School of Mechanical Engineering and is intended to be supplementary to the instruction given in architects' offices. It aims to supply a thorough knowledge of the history of the art, of building processes and materials, of scientific construction, and of composition and design. The technical studies begin with the first term of the Junior year, and are comprised under the following heads:

Elements of Architecture.—The five orders and their applications; arches; vaults; roofs; domes; spires; doors and windows; stairs.

History of Architecture.—The General history of Greece and of Greek art; Roman history and art; mediæval and modern history and art.

Scientific Construction.—Foundations, brick-work, stone-work; theory of the arch; strength of pillars and walls.

Specifications and Working Drawings.—Masonry; carpentry; plumbing; iron-work and ventilation; details and dimensions; estimates.

Theory of Architecture.—Ornamentation, etc.

Drawing and Design.—Free-hand drawing; tinting; solution of architectural problems; original design.

Books of Reference.—Fergusson's History of Architecture, Tredgold's Carpentry, Jones' Grammar of Ornament, Viollet le Duc's Discourses on Architecture, Gwilt's Encyclopedia of Architecture.

In connection with this course of study the same amount of shop-practice will be required as in the Mechanical Engineering course, and will include the use of tools and wood-working machinery, the construction of problems in stair-building and joinery, and such other work as may arise in the repairing and construction of buildings on the grounds.

SCHOOL OF CIVIL ENGINEERING.

PROF. BEAL.

The basis of this course of study is laid by a systematic drill in Algebra and Geometry during the Freshman year. In the Sophomore year, first term, Plane Trigonometry and Land Surveying are taught in the class room, and the latter is supplemented by work in the field where the student becomes acquainted with all the manual portions of the business, and acquires proficiency in the use of the chain, compass, transit, and other instruments. Notes are kept of the data taken as in actual work and from these the areas are calculated and the fields platted. In the second term Descriptive Geometry, Spherical Trigonometry, and Analytical Geometry are begun and the latter finished, having five recitations per week during the whole term. In the former, two recitations or lectures are given, in addition to which the student prepares twenty plates of drawings, each consisting of some special graphical problem which involves one or more of the general problems of Descriptive Geometry. By this means Mechanical Drawing is practiced at the same time that its underlying science is studied. Spherical Trigonometry occupies one exercise per week throughout the whole term.

In the Junior year the course becomes more strictly technical. During the first term the various methods of laying out railway curves, putting in switches and side-tracks, and setting slope-stakes, are taught, together with the principles of the construction of water works, sewers, retaining walls, and other combined structures. As nearly as possible all the problems investigated in the class-room are taken into the field and staked out upon the ground. Data are also taken for problems in earth work, both excavation and embankment, and the cubic contents calculated. In pure mathematics, Calculus is taught during the term, there being five recitations per week. Descriptive Geometry is continued in much the same manner as before, only dealing with the higher problems of Stereotomy, Shades, Shadows and Perspective, and Isometric. About twenty plates of drawings are prepared.

In the second term Analytical Mechanics and the Strength of Materials occupy five recitations per week. During this term, also, a practice survey of a portion of a line of railway is undertaken and the engineering of the work carried as far as is possible without the actual construction. The line is run, the curves put in, the profile taken, the grades determined upon, and it is then cross-sectioned and left ready for the contractor. The notes of the work are kept exactly as in actual practice, and from them a profile and plan are drawn, including, also, the more important topographical features of the adjoining lands.

A course in Astronomy is included in the department in this term. It is partly descriptive and partly mathematical, extending as far in the latter as the determination of latitudes and longitudes and the laying out of a true north and south line by observing the meridian transit of a star.

During the Senior year the student devotes himself to the higher problems of Engineering, such as the strength and stability of arches and suspension bridges, the construction of bridge and roof trusses and girders, and the laying of foundations. A portion of this year also is given to the designing of structures and calculations of their strength, with detailed drawings of the same: in a word, the office work of a constructing engineer.

The department is well-furnished with field instruments, consisting of two transits, two levels, one compass, chains, tapes, rods, poles, etc. The text-books used are Gillespie's Land Surveying, Henck's Field Book for Engineers, Wood on Roof and Bridge Trusses, Stoney on Strains, Allen on Dock Walls; while many others of a similar character are kept in the library for reference.

CALENDAR FOR 1880.

Monday,	March 1.	Term opens.
Tuesday,	March 2.	} Entrance Examinations.
Wednesday,	March 3.	
Thursday,	March 4.	Recitations begin.
	June 25,	} Term Examinations.
	to July 2	
Friday, 7:30 P. M.,	July 2.	} Junior Exhibition.
	July 2.	
Saturday,	July 3.	Summer Recess begins.
Tuesday,	July 20.	Second Term begins.
Tuesday,	July 20.	} Entrance Examinations.
Wednesday,	July 21.	
Wednesday,	July 21.	Recitations begin.
	Nov. 3,	} Term Examinations.
	to Nov. 10.	
Monday, 7:30 P. M.,	November 8.	} Address before the Literary Societies.
	November 8.	
Tuesday evening,	November 9.	} Address before the Trustees.
	November 9.	
Wednesday,	November 10.	} Commencement Exercises.
	November 10.	

Winter Vacation

From November 11, 1880, to March 1, 1881.

INDEX.

	PAGE.
Admission to College.....	146
To special schools.....	147
Agriculture, school of.....	168
Amendment suggested to Code.....	7
Appropriations of Board of Trustees.....	49, 71
Appropriations of Seventeenth General Assembly.....	17, 49
Appropriations needed from the State.....	5, 12
Architecture.....	163, 194
Bassett, G. W., contract with.....	56
Report of.....	37
Settlements with.....	44
Biology, school of.....	188
Board of Trustees, list of.....	48, 127
Committees of.....	48, 128
Officers of.....	48, 128
Proceedings of.....	48
Special report of.....	5
Botanical department.....	14, 100, 188
Botanical laboratory, contributions from.....	100
Card of enquiry.....	148
Chemical laboratory, experiments in.....	96
Chemistry, school of.....	186
Civil Engineering, course in.....	157
School of.....	195
Committees, list of.....	48
Contingent Principal fund.....	55
College buildings.....	145
College, laws establishing.....	134
Counties represented.....	133
Courses of Study, list of.....	144, 153
Course of Study in Civil Engineering.....	157
In Mechanical Engineering.....	155
In Science for Ladies.....	159
In Sciences related to Agriculture.....	153
In Veterinary Science.....	172
For Juniors and Seniors in, special Industrial Sciences.....	161
For post-graduates.....	163
Mixed, optional.....	164
Preliminary.....	161
Creamery.....	76

INDEX.

199

	PAGE.
Degrees.....	69, 165
Deposit, students.....	151
Dissertations for Juniors and Seniors.....	164
Domestic Economy.....	91, 177
Endowment fund.....	22, 29, 47
Entrance, conditions of.....	146
Excuses for absence.....	149
Expenses, students'.....	150
Experimental kitchen.....	13
Experiments in Horticultural Department.....	80
Faculty, action of Board concerning.....	51, 68
List of.....	51, 68, 129
Salaries of.....	51, 68
Farm, action of Board concerning.....	57, 63
Report on.....	73
Accounts of.....	77
Funds of the College.....	11
Garden.....	87
Government, rules for.....	148
Graduates, list of.....	61, 69
Summary of.....	131
Graduation, action of Board concerning.....	61, 69
Conditions of.....	154, 156, 158, 159
Thesis for.....	165
Grasses, analysis of.....	96
Holsteins.....	75
Horticulture, school of.....	169
Horticulture and Forestry, report on.....	79
Interest Fund, reports concerning.....	22, 29, 27
Improvements upon farm.....	77
Labor, students'.....	152
Ladies' Course in Science.....	159
Land Department, action of Board concerning.....	53, 64
Agent Bassett's Report on.....	37
List of lands forfeited in.....	54, 65
List of lands leased in.....	41
Settlements with.....	44
Summary concerning.....	46
Latin.....	181
Laws establishing the Agricultural College.....	134
Of General Assembly for government of College.....	137
Lightning-rods.....	115
Literature and Language, school of.....	180
Mathematics and Physics, school of.....	183
Mechanical Engineering, course in.....	155
Mechanical Engineering and Architecture, school of.....	192
Mileage and per diem of Board.....	62, 72
Military Science, school of.....	179
Money and valuables, care of.....	152
Nursery.....	80

	PAGE-
Officers, action of Board concerning.....	51, 66
Orchard.....	84
Philosophy, school of.....	191
Physical laboratory, contributions from.....	115
Physics.....	185
Political Economy.....	191
Post-graduate course of study.....	163
President's report.....	9
Printing office.....	66
Proceedings of Board of Trustees.....	48
Propagating house.....	88
Report of President.....	9
Of land agent Bassett.....	37
Of Secretary for 1878.....	26
Of Secretary for 1879.....	34
Of Secretary on settlements with agent Bassett.....	44
Of Treasurer for 1878.....	22
Of Treasurer for 1879.....	29
On appropriations from the State.....	17
On farm.....	73
On horticulture and forestry.....	79
Sabbath and worship.....	150
Salaries, action of Board concerning.....	51, 68
Science of Language.....	181
Secretary, Report of for 1878.....	26
Report of for 1879.....	34
Report of, on settlement with land agent.....	44
Small fruits.....	85
Societies.....	150
Special courses for Juniors and Seniors.....	161
Special Faculties.....	153, 155, 157, 159, 171
Stock upon farm.....	75
Strawberries.....	86
Students, action of Board concerning.....	61, 69
Student labor.....	76
Thesis, graduating.....	165
Treasurer, action of Board concerning.....	59, 70
Elections of.....	61, 71
Report of for 1878.....	22
Report of for 1879.....	29
Settlement with.....	59, 70
Trustees, Board of.....	48
Committees of.....	48
Officers of.....	48
Report of.....	5
Vegetable garden.....	87
Veterinary science.....	14, 170
Zoology.....	189

REPORT
OF THE
JOINT COMMITTEE
OF THE
EIGHTEENTH GENERAL ASSEMBLY
OF THE
STATE OF IOWA,
APPOINTED TO VISIT THE
STATE AGRICULTURAL COLLEGE,
LOCATED AT
AMES.

[PRINTED BY ORDER OF THE GENERAL ASSEMBLY.]

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