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OF THE VARIOUS

PUBLIC OFFICERS AND INSTITUTIONS

FOR THE YEAR

1878.

VOLUME II.

AUGUSTA:
SPRAGUE, OWEN & NASH, PRINTERS TO THE STATE.
1878.

ANNUAL REPORTS

OF THE

TRUSTEES, PRESIDENT,

Farm Superintendent and Treasurer,

OF THE

STATE COLLEGE OF AGRICULTURE

AND THE

MECHANIC ARTS.

1877.

Published agreeably to a Resolve approved February 25, 1871.

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TRUSTEES.

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TRUSTEES' REPORT.

To the Honorable Senate and House of Representatives, in Legislature assembled:

The Trustees of the College of Agriculture and the Mechanic Arts respectfully submit herewith their Eleventh Annual Report.

Indications of the growing usefulness of the college were never more flattering than during the present year. The change in the arrangement of college terms, reducing the number from three to two, and the revision of the course of study, proposed in the report of last year, have been carried into effect, and the result has proved very satisfactory.

Since the report of last year fifty-eight students have been admitted to the college, a much larger number than has been admitted before in a single year. Occasional changes made in the course of study, additions to the stock of apparatus, and the added experience of the professors, are contributing to increase the value of instruction from year to year.

The management of the boarding-house during the year has been very successful. Mr. and Mrs. Landers, who have had charge of the house, have furnished excellent board at very moderate cost. The interior of the boarding-house has been repainted and needed repairs have been made.

On the farm, the area of pasturage and field has been considerably enlarged. In addition to experiments that have been in progress for several years, new and important experiments in the application of fertilizers have been made, the details of which will be found in the report of the Farm Superintendent.

Farm House.

By the action of the Legislature last winter, the Trustees have been able to build a farm house on the site reserved for it near the new barn. The house is a substantial and thoroughly built wooden structure, of pleasing proportions, but very plain in finish both outside and inside. The roof is covered with slate. It was built under contracts that were considered very favorable to the college, and the contracts were faithfully executed. But in order to make its adaptations to the requirements of a large farm as complete as possible, it was found necessary to build considerably larger than was at first contemplated, and its cost has exceeded the appropriation. The building committee make the entire cost, including cistern, furnaces, plumbing, drainage and grading, $5,038.85.

The room in the large barn being occupied by neat stock, it was found necessary to provide a stable for the horses. A stable connected with the old farm buildings, being no longer needed there, was moved to a site near the new farm-house, remodelled and furnished with a manure cellar, at an aggregate cost of $611.24.

Mechanical Engineering.

In the report of last year attention was called to the fact that the department of mechanical engineering is regarded of much importance to the interests of industrial education, yet, in respect to its facilities for practical instruction, it is behind the other departments of the college. Attention was also called to the fact that the Russian system of shop instruction, then recently introduced into this country, afforded an apparent solution of the manner in which this difficulty could be overcome. The system had just then been adopted at the Boston School of Technology, with the sanguine expectation that it would prove a very effective aid to this branch of education. A years' experience has justified the confidence then expressed in regard to its feasibility and

importance. It may be said of this system that it appears to furnish an eminently simple, economical and effective method of teaching young men the use of tools. The Trustees respectfully ask your attention to the report of Prof. Pike bearing upon this subject.

Agricultural Education.

Nothing is better understood by the farmers of Maine than that the farming lands of the State are, as a general rule, becoming less productive than formerly. How to arrest this process of deterioration is one of the most important economic questions of the time. In other countries, where land has been longer under cultivation, and the question of bread for the people is more immediately pressing than here, this subject is eliciting the most careful attention; and as one of the most effective and immediately available methods of aiding agricultural practice, experimental stations have been established. So useful have these stations been found that in Germany alone more than fifty have been established, and the results have been highly satisfactory. There is a rapidly growing sentiment among the farmers of Maine in favor of such an agency. With the aid of the extensive laboratory at the State College the cost of establishing and maintaining a station would be comparatively small. It could scarcely fail to prove a valuable auxiliary to agricultural education, and its direct advantages to the farmers of the State would, in a few years, richly repay all the cost involved.

Respectfully submitted,

ABNER COBURN, *President.*

PRESIDENT'S REPORT.

To the Trustees of the Maine State College of Agriculture and the Mechanic Arts:

GENTLEMEN:—In presenting the annual report of the condition of the college for the past year, we can with pleasure refer to the evidences of efficiency in the several departments of instruction, and to the general prosperity of the institution.

The interest and support of our tried friends have been continued, and new friends of the cause of industrial education have been secured. Prejudices have been removed from many minds, as the aims and methods of the State College are better understood. The predictions, that no beneficial or practical results would follow from the expenditures made and from the efforts put forth, are refuted by the increasing number of graduates who are filling important places of usefulness, as educated farmers, mechanics, engineers and business men. The enlarged facilities are giving a broader scope to the education of working men. The success attained by some is kindling the aspirations of others to seek a liberal course of study.

COURSE OF STUDY.

We have tried to carry out fully the course of study that has been adopted, believing it to be the best for the institution. The demand sometimes made that the whole course of study and all the efforts of the teachers should be confined to the narrow theory of a practical education that consists only of the application of science directly to agriculture and the arts, without any regard to liberal studies or the disci-

pline of the mind, is not in accordance with the design of the college. Such a restriction might result in making the graduates skillful farmers, it would not make of the farmers educated men. Such a policy would be too narrow to meet the demands of those designing to become intelligent farmers or mechanics.

The revision of studies and the change of the terms made the last year have proved highly satisfactory. In the adjustment of the studies and the classes under the new arrangement some extra work has been required of the teachers and of the students who commenced their course under the old plan, but hereafter the classes will fall readily into the prescribed order.

Admission of Students.

The pressure of public opinion seems to demand that those from the country districts who have had the best training our Free High Schools afford should be allowed the privilege of entering the State College. There may be properly some allowance made for the embarrassment of candidates, many of whom are subjected for the first time to the test of a written examination, and for the natural timidity which renders some incapable of making a fair exhibit of their attainments. But with all suitable allowances, there is too often a lamentable deficiency in the attainments of some who are recommended for admission to the college. It is no kindness to the candidate to admit him to the higher studies of a college curiculum unless he can give correct answers to questions that fairly test his knowledge of the required studies for admission. There is neither time nor opportunity for the student to attend to preparatory studies after his admission. Students sometimes come not intending to complete their course of study. Such special students are not prepared to do satisfactory work in the classes where they recite or to receive much benefit unless they have the qualifications of those regularly admitted. Since our last report, at the commencement of the spring term twelve new students

joined the present Sophomore class; this autumn thirty-five were admitted as Freshmen, two joined the Sophomore class, one the Junior class, and eight have been received as special students, making in all fifty-eight students that have been admitted during the year.

Commencement.

The exercises of commencement were held on the week beginning June 23d. A large number of visitors were present, including the Trustees, members of the State government and of the Board of Agriculture.

The Sophomore declamations occurred on Saturday evening, and the Coburn prize for excellence was divided between A. Y. Merrill and H. W. Peaks. At the Junior exhibition on Monday evening, Miss Emma Brown was the successful competitor among those who contended for the Coburn prize for the best essay. The exhibition drill of the Cadets on Tuesday afternoon and the target practice drew a large crowd of interested spectators. Capt. C. C. Chamberlain made the best score. In the evening was the President's reception, attended by the Governor and Council and other visitors, the alumni, graduating class and their friends. On Wednesday were the exercises of the graduating class, interspersed with music by the Philharmonic Club of Boston. At the conclusion of the themes the diplomas were presented by Governor Connor with an appropriate address. He spoke of the design of the college and of the obligation of the graduates to make a suitable return to the State and the country for the provisions furnished for mental, moral and physical training, especially adapted to prepare young men for successful lives in industrial pursuits. The degree of Bachelor of Science was conferred on eight graduates, Bachelor of Civil Engineering on five, and Bachelor of Mechanical Engineering on four. On Thursday the usual exercises of Class Day were performed by the graduating class.

The State College and Board of Agriculture.

The connection between the College and the Board of Agriculture is not clearly defined. The law makes provision that the Secretary of the Board shall be one of the Trustees of the College, and that one of the sessions of the Board shall be held each year in the vicinity of the college, so that the students may participate in the exercises. This provision is met when the railroads will take the students gratuitously to the place of meeting wherever held. Although free transportation is granted, there is some expense to the students in making their arrangements for encampment during the session of the board. An opportunity is however afforded to them of visiting different parts of the State as well as of participating in the exercises. The students go as a military organization, and have some public work assigned them which exhibits their drill and scholarship. These exercises serve as a good advertisement of the college in those localities where our aims and methods of instruction are little understood. The general good deportment of the students on these excursions have reflected credit on the institution, and especially upon the military instructor in charge.

At the session of the board in Alfred the students made reports of the trials of different fertilizers on the college farm, and other experiments that had been conducted by them under the direction of the farm superintendent. These constituted an important and interesting part of the transactions of the board. The board had raised a committee to prepare a series of experiments to be tried at the college, but no action was taken by this committee. The experiments were arranged by your action in conference with the superintendent of the farm. The valuable information that results from the thorough trial of fertilizers and farm processes amply repay the expense of such investigations. These investigations should be more thoroughly pursued, and a complete experimental station should be provided for at the college. The system of agricultural experiment sta-

tions that has been found so valuable in Europe will soon be demanded and adopted in this country, and these stations should be connected with our colleges of agriculture.

Department of English Literature, Mental and Moral Science.

The instruction in this department has been under the charge of the President. The Freshmen study rhetoric one term. In addition to the regular text-book recitations they are required to prepare written exercises, by which they illustrate and practically apply the principles of the science. They are also required to analyze and criticise sentences, and by this are better prepared for writing the compositions required during their whole college course. In elocution all the students are required to take a part. Regular exercises in declamation continue through the four years in alternation with the exercises in composition. These exercises and the correction of essays has consumed much unaccounted time. The students need a thorough course of systematic instruction in the principles of elocution and voice-building from some one who could devote the necessary time, by which the well disciplined vocal organs could easily, correctly and forcibly express every shade of thought and sentiment. The graduates should all be good readers and speakers. If in the pressure of scientific studies the time of the student would admit of such attention as the importance of the subject demands, I should strongly urge the appointment of some one to this special work. I can do but little more than I have heretofore done in general exercises and in the especial drill for public occasions.

The Sophomores all recite a part of the spring term in the history of English literature. Those in the course of Science and Literature pursue this study in the Junior year, with the analysis and criticism of our standard authors. The design is to develop a correct literary taste and to lay the foundation of future profitable reading. The Seniors who are not in the courses of Engineering study the history of

civilization during the autumn term, while the spring term of twenty weeks is divided between the study of Mental and of Moral Science. All the Seniors have a short course in Political Economy with lectures on Rural Law. The studies in Logic and in the Constitution of the United States have been transferred to the military instructor.

As will be seen from the reports of the several departments there is need of additional room to accommodate the classes that are now in the college. Our recitation rooms are too small, and there is need of more apparatus. If a shop for instruction in the mechanic arts were erected the upper part of the building might be finished for a drawing room, and thus the pressure for more space for the classes might be partially relieved. The ornamental trees in the nursery ought to be transplanted at once to the lawn, in accordance with the excellent plan for ornamenting the college grounds prepared by Professor Hills; and the house vacated by the farm superintendent should be fitted up for the residence of a professor. Our library has received a valuable donation of books from the Bangor Library during the past year. Standard scientific works should be added yearly as they are published, that both teachers and students may have the best facilities for reference as well as general reading.

Respectfully submitted,

C. F. ALLEN.

DEPARTMENT OF MATHEMATICS AND PHYSICS.

President Allen:

The recitations to which I have attended during the present year, are algebra, geometry, trigonometry, analytical geometry, calculus, (differential and integral) and astronomy, and in these branches of study the usual degree of advancement has been made by the several classes.

The members of the class in practical astronomy acquired a commendable facility in the use of the sextant, the transit instrument for the determination of time, and in the use of the Repsold Vertical Circle, which is proving a valuable adjunct to the apparatus in this department. They also had liberal practice in the reduction of their observations for the determination of latitude and longitude.

There has been no class in physics, as this subject, hitherto pursued in the Freshman year, was transferred in the recently adopted scheme of studies to the Junior year. Instruction in the science of physics will be resumed the latter part of next term.

Within the year a small addition has been made to the apparatus for illustrating the principles of light, but on account of a pressing want of apparatus in some of the other departments only a part of the appropriation solicited for this department could be made available for it. It is essential, as the study is to be resumed in a short time, that further additions be made to the stock of physical apparatus, particularly of those pieces which are most serviceable in illustrating the principles of light and electricity. Attention is also called to the need of inside shutters for the chapel, which is now used for a physical lecture room.

In the interests of another department I desire to direct attention to a system of mechanical instruction of which I believe this institution will do well to avail itself. I refer

to the Russian method of teaching the mechanic arts. For students preparing for mechanical pursuits this system offers the advantages of the manipulations of the shop at a moderate outlay on the part of the State. I sincerely hope that the Trustees will make recommendation of, and the Legislature make provisions for, such shops as may be needful to give the system a fair trial, believing, as I do, that the result will justify the necessary expenditure.

Respectfully submitted,

M. C. FERNALD.

DEPARTMENT OF ENGINEERING.

President Allen:

During the last year a change has been made in the instruction in this department, the field work and drawing having been put into the hands of Prof. Hamlin, who will report upon the work done in those directions. By this change we have both been able to do more thorough work than under the old arrangement, and by changing the order of studies somewhat, have been able to greatly economize our time. Since the above change was effected I have confined myself wholly to class-room work, and have been able to give the students in my department more individual attention than was possible before.

I have this year given instruction in surveying and in civil and mechanical engineering. The Sophomore class in surveying had daily recitations for about two-thirds of the spring term, and as a general thing the class made very satisfactory progress. Beside these daily recitations, the students were required to perform a large number of problems, putting into practice the principles learned in the class-

room. This work, it will be remembered, is additional to the field-work reported on by Prof. Hamlin.

In civil engineering I have given instruction in Henck's Field Book, Rankine's Applied Mechanics and Rankine's Civil Engineering, and during the spring term gave a number of lectures on the locomotive to the students in both civil and mechanical engineering. In mechanical engineering the text-books used have been Rankine's Machinery and Millwork, including Mechanics, and Rankine's Steam Engine.

The text-books referred to above have been used simply as guides, and their contents have been extensively supplemented by examples of the best practice and by reference to standard works on the various subjects. In order that students in this department may get more than a mere proof that certain statements made in their text-books are correct, a subject is never considered finished until the class have applied the principles to some practical problem. As an example, when the students in civil engineering are at work on the principles of the strength of beams or bridges, they are required to design and calculate the dimensions of various examples of each. In a similar way, when the mechanical engineers are studying the principles of heat as applied to the steam engine, they are required to make designs for engines and boilers. In all such cases the designs made by the students are rigidly examined, and errors or anything that would prevent their actual construction pointed out to them. By this method students acquire a knowledge of the application of theory to practice, which is of great value to them.

During the last year no additions have been made to the apparatus in civil engineering, and no changes other than the general ones mentioned above have been made in the method of instruction.

In mechanical engineering we have had the benefit of the steam engine and indicator purchased last spring. The graduating class made many experiments and did much work with them. By this means they got a thorough knowledge of the

methods of testing and working up the power of engines and of setting the valves, knowledge which they could not otherwise have obtained, as no amount of class-room instruction can take the place of actual experience in such cases.

During their last term the Senior class in both courses devoted themselves wholly to designing (having finished their text-book work,) and accomplished some very creditable designs for bridges, roofs and machinery.

This year the Seniors, as a condition of graduation, were required to present technical theses, which were intended to show their ability to deal with practical questions. Owing to the change in the terms the last college year was several weeks shorter than usual, and hence a lack of time prevented the theses from being just what was intended; nevertheless they were on the whole very satisfactory. In selecting subjects for their theses the students are hampered by a scarcity of good examples of engineering in this vicinity. In as many cases as possible students have taken such bridges, engines, &c., as were accessible, and have made careful calculations of the various parts to determine if they were capable of performing the duty assigned them. As these theses are kept on file, it is hoped that in the course of a few years we shall have a valuable collection of data from which the character and condition of the various important engineering structures in the State can be determined.

The following is a list of the graduates of this year from the department of engineering, with the subject of their theses:

Bachelors of Civil Engineering.

A. D. Blackinton—R. R. Bridge over Penobscot river at Oldtown.

R. B. Burns—Trapezoidal Truss built by the Phœnixville Bridge Company.

J. C. Lunt—Iron Bow String Bridge at Olamon.

G. E. Sturgis—Draw Bridge on Bucksport R. R. at Bangor.

C. E. Towne—Tunnelling.

Bachelors of Mechanical Engineering.

A. J. Elkins—Steam Engine at Water Works in Bangor.
S. Shaw—Teeth of Wheels.
T. J. Stevens—Steam Engine Indicator.
J. W. Weeks—Steam Engine owned by the College.

Work Shops.

Last year I called your attention, and that of the Legislature, to the great necessity of some facilities by which we can give practical instruction in the mechanic arts, and I wish again to urge the same need with more emphasis if possible.

Our college is one of agriculture *and* the mechanic arts, but up to this time absolutely no provision has been made for practical instruction in the latter division. I have endeavored in the first part of my report to show what we are trying to do in this direction, but where the instruction is confined wholly to the class-room it is no instruction at all in the mechanic arts, strictly speaking.

It seems to me that the college should be in position to give thorough and practical instruction to young men who wish to obtain a systematic knowledge of the use of tools. The time has gone by when a young man can get this knowledge by entering a shop as an apprentice. In this age of the division of labor very few men get to be skillful in the use of more than one tool, hence the ordinary shop is not the place to look for men who can properly superintend the construction of machinery, being able to judge of the work in all its details. It seems then that for men who wish to be first-rate mechanics, and not parts of a machine, we must provide some other instruction than that to be had in the average shop.

It has hitherto been supposed, in this country, that the only way to give such instruction is for some school or college, like the Worcester Technical Institute, to establish a manufacturing business and provide opportunity for young men to go through the establishment, working of course at

such operations at any time as may be necessary for the business of the shops. A great drawback to such a plan as this, at any rate in this State, is the large outlay to begin with, and, usually, the large annual demand for funds which is necessary to the establishment and maintenance of such shops. Besides this is the fact that in such shops it is impossible to make the course for students such as is best for instruction purposes. Such shops must, unless endowed with a larger sum than I dare here think of, make such articles as can be sold, and must employ their students in the work most profitable to the shops rather than to the student.

There is a natural order of instruction in most things, and it is held that manual instruction is no exception to the rule. If we examine the matter carefully we shall see that, whatever the branch of work, there is a comparatively small number of general processes into which it may be divided. To illustrate this: in the construction of a machine there is usually foundry work, forge work, and finishing, which includes vise, lathe and planer work, &c. If, again, we look at each of these divisions, we see that they are capable of further sub-division, and general experience tells us that we can best learn each of these processes by attempting them one at a time. For instance, let us consider work done at the vise, and we shall see that vise work divides into—filing, sawing, tapping, chipping, reaming, thread-cutting, &c. Filing can be divided into—filing to line, filing to template, draw-filing, free-hand filing, &c. Now it is held, that filing can best be taught by teaching first to file to line, then to template, &c.; that vise work can be best taught by teaching filing first, then sawing, then tapping, &c.; and finally that the art of using tools in general, can best be taught by teaching one element at a time, arranging the processes in such an order that the progress shall be from the simple operation to the more complex.

This method of instruction is not the dream of a theoretical man, but has stood the test of ten years' trial in Russia, has

been in operation for more than a year in this country, and has accomplished astonishing results. Last year it may have been thought by some to be an experiment, but it is now an assured success. I have in my possession at present, specimens of the work done in two of the shops established by the Institute of Technology. This work was done by young men who on entering the shops knew nothing of the use of tools; it has been examined by many mechanics, and is invariably pronounced by them to be as good work as any regular machinist can do. A gentleman connected with one of the large machine shops in Philadelphia said, in examining this work, that it was better than his men could do.

I have endeavored in what I have said, to make clear the plan and scope of the shops we hope to establish at once in connection with the State College. Maine needs just now to develope her industrial resources, and she cannot do it better than by giving her young men the education needed to fit them to carry on such development.

In my report last year, I gave an estimate of the cost of establishing such shops as we need, and a year's additional research has shown that estimate to be in the main correct. In the item of a shop building a change has been made. Last year it was thought that what is known as the "long barn" could be remodelled and adapted to this purpose; it however appears that the barn is needed for farm purposes, and estimates show that it would cost nearly as much to adapt that building as to build a new one, which will be just what is needed. I have made plans of the building needed, and have had careful estimates made upon it by an experienced and reliable builder. Below are his estimates for a two story building sixty-five by forty five feet:

(1)	Plain wooden building, shingled, 65x45,	$1,500
(2)	" " " slated, 65x45,	1,800
(3)	" " " mansard roof, slated, 65x45,	2,300
(4)	" brick building, slated, 65x45,	3,300
(5)	" " " mansard roof, 65x45, slated,	3,800

(3) and (5) are estimates for a building with a third story, divided into drawing rooms. This plan is proposed as relieving very much the great lack of room now felt by the whole Faculty. Our prospects for students have never been better than now, and we are very much crowded in our small recitation rooms. By putting a mansard roof on the shop building, a number of rooms now occupied by the drawing department would be set free, and the immediate pressure released.

The other estimates are as given last year, and are presented below:

For fitting up vise shop,	$500 00
" foundry,	500 00
" forge,	500 00
" lathe and planer shop,	2,000 00
" wood shop,	500 00
" engine room,	800 00
For instruction,	1,000 00
	$5,800 00

From this estimate it will be seen that $5,800.00 is needed to fit up the shops, and pay for instruction for the year. The amount spent upon the building depends upon the one selected, but it seems as if it would be false economy to consider anything lower than the third estimate, as the additional cost of that over the first two is trifling, compared with the greater permanence and saving of room obtained by its adoption.

Trusting that this year the efforts made in behalf of workshops for the college may be successful, I am,

Very respectfully,

W. A. PIKE, *Prof. of Engineering.*

DEPARTMENT OF NATURAL HISTORY.

President Allen:

During the past year I have given instruction in physical geography, human anatomy, physiology and hygiene by means of text-books and lectures; in botany by text-books, lectures and excursions; in zoology, entomology and comparative anatomy by lectures, excursions and cabinet work; in determinative mineralogy by lectures and laboratory practice; in geology by lectures and excursions.

The above recitations, except the mineralogy, have been conducted in the natural history room, which is far too small for the large classes. The exercises in free-hand drawing and book-keeping have also been conducted in this room, and such a constant use of it by large classes immediately following each other, renders the air very impure and also causes a large amount of dust, which settles into the cases and upon the specimens, seriously injuring many of them. I therefore desire that some arrangement may be made by which other rooms may be provided for these larger classes.

Your attention was called, in my report of last year, to the educational advantages of an arboretum upon the college grounds. A site has been selected by the committee appointed by the Trustees, for that purpose, and the ground is now under cultivation, and in due time a beginning will be made towards transplanting into it the native trees and shrubs of the State.

The policy I have been acting upon, and the end towards which I have been working, since my connection with the college, is to have as complete a representation as possible of the flora, fauna, minerals and building materials of the State in our collections; but as no suitable cabinet has as yet been provided, I have confined my work to the collection

and preservation of such objects as can be packed away and preserved till such time as a suitable and properly arranged cabinet is built, when the larger forms may be collected, and all these objects, large and small, put on exhibition and rendered available for instruction.

Natural history is emphatically an objective study, and the idea of attempting to give instruction in objective studies without any objects, or at least diagrams of the objects, is simply absurd. Of the branches I am called upon to teach, no one more imperatively demands material for illustration than comparative anatomy, I therefore desire to call attention to the needs of this department, and request that an appropriation be made to procure apparatus and diagrams.

Respectfully submitted,

C. H. FERNALD.

DONATIONS TO THE CABINET.

Silver Ores from Utah,	presented by	G. M. Shaw.
Minerals from Cuba,	"	Mrs. Jas. How.
Magnetic Iron Ore from Camden,	"	O. C. Fuller.
Collection of Insects,	"	W. H. Jordan.
Minerals from Camden,	"	F. O. Mansfield.
Botanical Specimens,	"	F. M. Bisbee.
Collection of Earths from Cuba,	"	R. S. Howe.
Fossils from Moosehead Lake,	"	H. F. Eaton.
Ferns from England,	"	Miss L. I. Wood.
Minerals from Orono,	"	Miss A. T. Emery.
Specimens from Oldtown,	"	M. Randall.
Horned Toad from California,	"	Henry Colburn.
Minerals,	"	Joseph Wilson.
Collection of Seeds and New Era Coffee,	presented by	S. S. Putnam.

CHEMICAL DEPARTMENT.

President Allen:

The work of this department has not been materially affected by the altered division of the college year.

During the term beginning Feb. 6, 1877, the Sophomore class took two hours of laboratory work in qualitative analysis daily; besides this class, the Senior chemical students recited in Naquet's Principes de Chimie, Vol. II, embracing a thorough review of organic chemistry in its present state. After they had finished this work, I gave a few lectures on practical subjects with especial reference to use and care of apparatus.

The Junior class recited in Vol. I of Naquet's Chemistry, which gives an excellent course in inorganic chemistry.

My afternoons were taken up by the last two mentioned classes who performed quantitative estimations, including the simplest determinations, as well as estimations of a complex character. The book used by the students in connection with this work is Fresenius' Quantitative Chemical Analysis; frequent use is made of Nason's Woehler's Mineral Analysis, J. Alfred Wanklyn's Milk Analysis, as well as other books found in the college library.

During the second term of this year beginning in August, I instructed the Sophomore class in General Chemistry, the book being the same as the one used last year; the students of this class were divided into two sections for afternoon work, each section working one afternoon per week and performing experiments illustrative of the subjects touched upon in the book, such as: Preparation and Properties of Oxygen, Hydrogen, Nitrogen, Chlorine, etc., experiments on acids, bases, and salts, &c.

The Junior classes of the Agricultural and Chemical courses recited in agricultural chemistry. It would be advantageous

to the students if this course could be prolonged into next term; it is, however, at present impossible, as all my time will be fully occupied.

The Senior class of the chemical students recited in organic chemistry. My afternoons were taken up by the Junior and Senior students, who worked in quantitative analysis.

During a part of this, as well as the previous term, three graduates from the college worked in the laboratory, pursuing post graduate studies.

The appropiation allotted to my department last year being a little over half what I asked for, some of the same needs still exist, besides new ones occasioned by the increased number of students taking quantitative analysis. Two new balances should be supplied, also a proper polarizing apparatus for the determination of sugars, etc., in solution. Soleil's or Wild's polariscopes are very serviceable instruments, either one of which would be a valuable addition to our present stock of apparatus. Many other pieces, such as platinum ware and stationary steam water baths, are needed. Five hundred dollars could profitably be spent without going beyond the limits of the strictest requirements of the department.

I daily feel the want of more room; my private laboratory is now converted into a store and recitation room, thus leaving me without a proper place in which to work. It is earnestly hoped, that by the erection of workshops, the chemical building will be relieved of some of its present occupants.

My time has been so entirely taken up by purely educational work, that I have had to refuse to analyze substances which have been forwarded to me. Some of my students have made a few analyses of this kind. I have also had to neglect making sugar beet determinations; one of my students has, however, made a few such determinations, so that I shall be able to make a partial report at some future date.

Respectfully submitted.

ALFRED B. AUBERT.

DEPARTMENT OF MODERN LANGUAGES AND MILITARY INSTRUCTION.

President C. F. Allen:

SIR,—The recent changes in the course of studies have necessitated this year the formation of two classes in French, but with the beginning of the next term the instruction in the department of languages will conform to the course of studies as now planned.

The present Junior and Sophomore classes have pursued their studies in French since the opening of the term in February of this year, and the Junior class has had instruction in German since the beginning of the term just closed. The *French Principia* and *Otto's German Grammar* have been used as text-books.

In French, the classes have been well exercised in the construction of French sentences and thoroughly drilled on regular and irregular verbs. They have, in addition, translated George Sand's *Dames Vertes*, a work of two hundred pages, and the result of their final examination has been quite satisfactory.

In German, the class has yet another term for instruction. They have made commendable progress and are well advanced.

I have also given instruction during the year in the United States Constitution and logic to the Senior class and in book-keeping and commercial forms to the Freshman class, using as text-books *Andrew's Manual of the United States Constitution* and *Schuyler's Logic*. The instruction in book-keeping has been pursued by a system of lectures and the keeping, by the students, of a set of books and forms.

Military Instruction has been given two hours a week, except when prevented by the weather, in infantry drills

only. I would recommend that four hours a week be hereafter assigned to military instruction. The same length of time is given in many other State Colleges, and this can be devoted here without interference with recitations or study hours. The time now allowed only permits instruction in infantry drill and it is my purpose to vary the instruction, if possible, by conveying some knowledge of other branches of the military service; of essential principles of strategy and grand tactics, the study of important campaigns; of army organization, field fortification, weapon and projectiles, et cetera, by means of lectures.

The value of military instruction to a State cannot be overrated, and in a country so liable to communistic and other sudden disturbances—the strong arm of whose government must be the military, to obtain and keep peace—the period when military knowledge is urgently demanded can never be foretold.

Upon the invitation of the State Authorities the battalion of "Coburn Cadets," composed of all the male students, participated in the Encampment at Augusta in August. The cadet companies formed the nucleus of the "Cadet Battalion," in pursuance of the plan of the State Authorities for the organization of the cadet companies of the State. The opportunities presented for instruction, and the experience acquired, were of great benefit to the cadets, and I am pleased to mention that their individual efforts to earn the highest reputation attainable for excellence in military exercises, camp duties and gentlemanly deportment won the admiration of many and constituted an *esprit de corps* that was fully recognized by the authorities and the public.

The cadets also attended the meeting of the State Board of Agriculture at Alfred in October, giving an exhibition of infantry movements at that place and, by request, at Gorham, where they were very hospitably entertained.

I would ask a consideration of the necessities of a drill shed and gymnasium during the cold season and inclement

weather. There is on hand a quantity of lumber contributed several years ago by some citizens of Orono for this purpose, but not sufficient to complete the shed. The students volunteer to perform the labor required. Four hundred and twenty-five dollars would be required to complete the shed, and two hundred dollars to equip the gymnasium.

I recommend the purchase, for the military department, of twenty-four copies of infantry tactics, required for frequent reference by the students.

By request of the Trustees, at their last meeting I submitted to them a plan for the improvement of the College Grounds at the least possible expense. I would invite attention to the fact that the ornamental trees and shrubs in the nursery need to be transplanted, and are already much damaged from being over crowded. An appropriation for this purpose seems advisable, as well as for laying out the required roads and walks contemplated in the plan for the disposition of these trees and shrubs.

Respectfully submitted,

FRANCIS L. HILLS.

DRAWING AND FIELD WORK.

President Allen:

I have instructed, during the year, the Sophomore class in mechanical drawing, in the field practice connected with their surveying, and in free hand drawing; the Junior class in the civil and mechanical engineering courses in field work and drawing; and the Senior class in the same courses in descriptive geometry, drawing and field work.

The Sophomore class, during the first ten weeks of the spring term, worked two and a half hours each day on general problems in mechanical drawing, and elementary

geometrical projections. The remaining nine weeks of the term they were engaged in the field, afternoons, becoming familiar with the use and care of the instruments, putting into practice the problems found in their text-books, and making surveys with the necessary drawings of several farms and house lots, in the village.

This term the Sophomore class has devoted one hour each day to the study and practice of free-hand drawing. The drawing models which have been procured this year have proved to be of very great service; and with their aid and the extra amount of time at my disposal much more has been accomplished in this work than has been possible heretofore. Additional models and a suitable room to work in are much needed, in order to bring the work up to the proper standard.

The members of the Junior class, in civil engineering, have worked two and a half hours, each suitable day, in the field during the greater part of the term, and have laid out nearly all of the railroad curves found in Hencks Field-book, put in turnouts and frogs, and practised levelling and setting slope-stakes.

The Senior class in civil engineering have made a topographical survey of a portion of the college farm; and have surveyed the route, made the necessary drawings, and calculated the excavations and embankments for a railroad extending from Orono to Stillwater. It is my object to make this work as practical and valuable to the student as though the road were to be built. The termini, way stations, gauge of road-bed, use of the road, and financial condition of the company being given, the students are required to use their own judgment in determining its location, grades, position of stations; and finally each student is required to estimate the cost of building and equipping the road.

In running out railroad lines and in making surveys in the village, we are obliged to work on land which does not belong to the college; and I wish to acknowledge the kindness and interest of all, of whom we have asked favors in this connection, and especially of Messrs. Eben and Paul Webster.

The drawing done in both the mechanical and civil engineering courses, has been as heretofore, except that the work of the Senior class has been disturbed by the change in the number and arrangement of the terms. Nearly all the drawings made after the student enters either of these courses, are made from dimensions taken by himself from machines which he finds in actual practice, or from dimensions designed by himself; and here I wish to acknowledge our indebtedness to Messrs. Hinckley & Egery of Bangor, for the facilities which they have furnished us for inspecting and taking the measurements of their excellent machinery.

We feel the need every year, in our field work, of a plane-table, and it should be supplied at the earliest date possible. But our wants are most pressing in connection with drawing. The room which at present is used for a drawing room, is inadequate to the wants of the department. It was fitted up for mechanical drawing alone, consequently there is no room for free-hand drawing; and I have been obliged to use the natural history room for this purpose, which is poorly lighted and not properly supplied with tables. The drawing room is not suitable for mechanical drawing, because it is not properly lighted, there being no light from above, and it being dark on two sides, and because the tables are large, so that very often fourteen students are obliged to work at the same table, thus producing a continued jar, which renders it almost impossible to do good work. A drawing room should be well lighted from above, and from the sides. Should a building be erected for the workshops, these accommodations could be provided at a very small additional cost, by putting on a mansard roof, and finishing the third story for a set of drawing rooms. It is of the greatest importance to the success of our work that the needed room be provided as soon as possible.

Respectfully submitted.

G. H. HAMLIN.

Condition of the Library.

During the past year 1,007 volumes and 53 pamphlets have been added to the library. The whole number of books in the library at the present time is 3,648, and 636 pamphlets. Of the books received during the year, there are from

The Bangor Library, 930 volumes.

Hon. S. L. Boardman, 22 volumes and 7 pamphlets.

Hon. Hannibal Hamlin, 8 volumes.

U. S. Department of the Interior, 10 vols. and 11 pamplets.

U. S. Department of Agriculture, 2 volumes.

U. S. Commissioner of Education, 2 volumes.

Smithsonian Institute, 3 volumes.

Secretary of State of Maine, 3 volumes.

Secretary of State of New Hampshire, 1 volume.

Mr. J. E. Church, 2 volumes.

Hon. J. L. Chamberlain, 1 volume.

Mr. D. S. Fisher, 1 volume.

Prof. C. H. Fernald, 1 volume.

The Coburn Fund 7 volumes.

Magazines bound, 13 volumes.

Twenty-four numbers of the Historical Magazine have been received from Mr. Henry B. Dawson. Pamphlets from Hon. Selden Connor, Hon. Charles Buffum and Prof. W. A. Pike.

Additional alcoves have been placed in the library, which will supply shelf room for some time to come.

There is a constant demand both by the Faculty and the students, for books of reference that are not now in the library, and which should be supplied as soon as possible.

In accordance with a suggestion from Mr. Boardman, I have commenced an accession card catalogue, and several hundred of the most valuable books have been catalogued. It is my intention to continue this work until all the books and pamphlets in the library are properly catalogued.

Respectfully submitted,

G. H. Hamlin.

FARM SUPERINTENDENT'S REPORT.

The experiments herewith reported, were authorized by a Committee of the Board of Trustees, Messrs. Boardman, Hinks and Wingate, who were appointed to advise with and assist me in this and other matters pertaining to the farm. I am indebted to them for many helpful suggestions, and am especially grateful to be thus relieved from the entire responsibility of farm management.

Experiment in feeding swine with cooked meal and raw meal, to ascertain the relative value of such food for the production of pork.

This experiment has been tried eight years in succession, the time devoted to the trial having been in most instances twenty-four weeks. The results have in every case pointed to the superior value of uncooked meal for the production of pork.

The four pigs fed this year were from two litters, Nos. 1 and 2 being of the same parentage as were those taken in 1875–6, a cross between a Yorkshire boar and a White Chester sow. Nos. 3 and 4 were pure bred Yorkshires. The first two were ten weeks old at the beginning of the experiment, the last two were five weeks old. The pigs were kept separately in small pens with open yards, affording opportunity for exercise, and for access to the fresh earth. Grass, weeds and charcoal were occasionally fed to them as conducive to appetite and health. A quantity of food, adequate to the wants of each, was fed daily. The food for each pig was weighed and prepared every morning. During the first four weeks of the experiment No. 1 was fed on cooked meal and No. 2 received raw meal. For the second

period of four weeks No. 1 received raw meal and No. 2 was fed with cooked meal. This method of alternating the kind of food given, which was continued throughout the experiment, has been thought by some to be unwise because of the complete change that is made in the character of the food at the end of each period of four weeks. The objection is not without some reason. To test both methods of feeding, no change was made in the food given Nos. 3 and 4. Throughout the time of the experiment No. 3 was fed cooked meal and No. 4 was fed raw meal.

The pigs made but little gain, and were apparently in an unhealthy condition during the first eight weeks. Skimmed milk was for this reason fed to them with their meal, at the rate of three pounds of milk to one pound of meal, from July 9th to Sept. 3d—a period of eight weeks. The result was a decided improvement in condition, and a more satisfactory growth. In computing the cost of the pork and the relative value of the food the milk is not taken into the account.

	No. of pig.	Kind of food.	Pounds of food.	Cost of food.	Increase in weight.	Cost per pound of increase.
End of first week.....	1	Cooked meal,	9.5	14.25	loss,1.	–
	2	Raw,	9.5	14.25	2.5	5.7
	3	Cooked,	7.	10.5	0.	–
	4	Raw,	7.	10.5	loss,0.5	–
End of second week	1	Cooked meal,	7.	10.5	loss,0.5	–
	2	Raw,	7.	10.5	3.5	3.
	3	Cooked,	5.5	8.25	loss,2.5	–
	4	Raw,	6.25	9.37	0.	–
End of third week.....	1	Cooked meal,	7.25	10.87	0.5	71.24
	2	Raw,	8.	12.	loss,1.	–
	3	Cooked,	5.75	8.62	1.	27.37
	4	Raw,	6.25	9.37	1.	29.24
End of fourth week.....	1	Cooked meal,	7.75	11.62	loss,0.5	–
	2	Raw,	7.75	11.62	loss,3.	–
	3	Cooked,	5.75	8.62	loss,1.5	–
	4	Raw,	6.5	9.75	loss,1.	–
End of fifth week	1	Raw meal,	10.	15.	1.	26.62
	2	Cooked,	7.25	10.87	2.	17.24
	3	Cooked,	6.75	10.12	1.5	12.49
	4	Raw,	7.25	10.87	1.	20.62
End of sixth week.....	1	Raw meal,	10.	15.	0.	–
	2	Cooked,	7.5	11.25	loss,1.	–
	3	Cooked,	7.75	11.62	1.	11.62
	4	Raw,	8.	12.	0.	–

	No. of pig.	Kind of food.	Pounds of food.	Cost of food.	Increase in weight.	Cost per pound of increase.
End of seventh week	1	Raw meal,	9.5	14.25	6.	4.87
	2	Cooked,	7.25	10.87	3.	7.37
	3	Cooked,	9.	13.5	3.	4.5
	4	Raw,	9.	13.5	6.	4.25
End of eighth week	1	Raw meal,	13.	19.5	6.	3.25
	2	Cooked,	13.5	20.25	6.	3.37
	3	Cooked,	9.75	14.62	5.	2.92
	4	Raw,	11.	16.5	6.	2.75
End of ninth week	1	Cooked meal,	15.75	23.62	10.	2.36
	2	Raw,	14.	21.	8·	2.62
	3	Cooked,	7.75	11.62	2.	5.81
	4	Raw,	12.25	18.37	7.5	2.45
End of tenth week	1	Cooked meal,	17.	25.5	10.	2.55
	2	Raw,	16.5	24.75	15.	1.65
	3	Cooked,	10.5	15.75	6.	2.62
	4	Raw,	13.5	20.25	8.	2.53
End of eleventh week	1	Cooked meal,	19.25	28.87	7.	4.12
	2	Raw,	19.25	28.87	1.	28.87
	3	Cooked,	7.5	11.25	2.	5.62
	4	Raw,	17.5	26.25	6.5	4.04
End of twelfth week	1	Cooked meal,	19.25	28.87	10.	2.89
	2	Raw,	19.25	28.87	12.	2.41
	3	Cooked,	8.5	12.75	1.	12.75
	4	Raw,	17.5	26.25	9.	2.92
End of thirteenth week	1	Raw meal,	21.	31.5	8.	3.94
	2	Cooked,	21.	31.5	4.	7.88
	3	Cooked,	10.5	15.75	1.	15.75
	4	Raw,	19.5	29.25	7.	4.18
End of fourteenth week	1	Raw meal,	21.	31.5	13.	2.42
	2	Cooked,	21.	31.5	16.	1.97
	3	Cooked,	12.	18.	9.	2.
	4	Raw,	20.	30.	12.	2.5
End of fifteenth week	1	Raw meal,	21.	31.5	7.	4.5
	2	Cooked,	21.	31.5	5.	6.3
	3	Cooked,	12.	18.	2.	9.
	4	Raw,	21.	31.5	7.	4.5
End of sixteenth week	1	Raw meal,	24.5	36.75	4.	9.19
	2	Cooked,	24.5	36.75	5.	7.35
	3	Cooked,	12.	18.	loss,4.	–
	4	Raw,	24.5	36.75	7.	5.25
End of seventeenth week	1	Cooked meal,	26.5	39.75	2.	19.87
	2	Raw,	26.5	39.75	7.5	5.50
	3	Cooked,	9.	13.5	loss,3.	–
	4	Raw,	26.	39.	4.	9.75
End of eighteenth week	1	Cooked meal,	28.	42.	13.	3.23
	2	Raw,	28.	42.	6.5	6.46
	3	Cooked,	10.5	15.75	loss,2.	–
	4	Raw,	28.	42.	3.5	12.
End of nineteenth week	1	Cooked meal,	35.	52.5	1.	52.5
	2	Raw,	35.	52.5	5.	1.05
	3	Cooked,	11.5	17.25	6.	10.75
	4	Raw,	35.	52.5	7.5	7.
End of twentieth week	1	Cooked meal,	35.	52.5	14.	3.75
	2	Raw,	35.	52.5	6.	8.75
	3	Cooked,	12.	18.	loss,5.	–
	4	Raw,	33.	49.5	loss,2.	–
End of twenty-first week	1	Raw meal,	35.	52.5	1.	52.5
	2	Cooked,	35.	52.5	7.	7.5
	3	Cooked,	10.	15.	1.	33.
	4	Raw,	28.	42.	9.	10.17

	No. of pig.	Kind of food.	Pounds of food.	Cost of food.	Increase in weight.	Cost per pound of increase.
End of twenty-second week.....	1	Raw meal,	35.	2.5	7.	7.5
	2	Cooked,	35.	52.5	10.	5.25
	3	Cooked,	10.	15.	loss,2.	-
	4	Raw,	28.	42.	5.	8.4
End of twenty-third week.....	1	Raw meal,	42.	63.	13.	4.85
	2	Cooked,	42.	63.	9.	7.
	3	Cooked,	10.	15.	loss,1.	-
	4	Raw,	24.	36.	9.	4.
End of twenty-fourth week.....	1	Raw meal,	52.	78.	11.	7.09
	2	Cooked,	45.	67.5	8.	8.44
	3	Cooked,	14.	21.	1.	51.
	4	Raw,	35.	52.5	0.	-

Periods of Four Weeks.	No. of pig.	Food.	Pounds in four weeks.	Cost for four weeks.	Pounds gain in four weeks.	Cost per pound of increase in weight.
First.....	1	Cooked meal,	31.50	47.24	loss,1.5	-
	2	Raw,	32.25	48.37	2.	24.18
	3	Cooked,	24.	36.	loss,3.	-
	4	Raw,	26.	39.	loss,0.5	-
Second.....	1	Raw meal,	42.5	63.75	13.	4.90
	2	Cooked,	35.50	53.25	10.	5.32
	3	Cooked,	33.25	49.86	10.5	4.75
	4	Raw,	35.25	52.87	13.	4.09
Third.....	1	Cooked meal,	71.25	106.87	37.	2.89
	2	Raw,	69.	103.50	36.	2.87
	3	Cooked,	34.25	51.37	11.	4.67
	4	Raw,	60.75	91.12	31.	2.94
Fourth.....	1	Raw meal,	87.5	131.25	32.	4.10
	2	Cooked,	87.5	131.25	30.	4.28
	3	Cooked,	46.5	69.75	8.	8.72
	4	Raw,	85.	127.5	33.	3.86
Fifth.....	1	Cooked meal,	124.5	186.75	30.	6.22
	2	Raw,	124.5	186.75	25.	7.47
	3	Cooked,	43.	64.5	loss,4.	-
	4	Raw,	122.	183.	13.	14.08
Sixth.....	1	Raw meal,	164.	246.	32.	7.69
	2	Cooked,	157.	235.5	34.	6.93
	3	Cooked,	44.	66.	loss,1.	-
	4	Raw,	115.	172.5	23.	7.50

Each pound of live weight produced by feeding coooked meal to pig No. 1, cost 5.2 cts.
" " " " " No. 2, " 5.7 "
" " " " " No. 3, " 15.7 "
" " " " raw meal to pig No. 1, " 5.7 "
" " " " " No. 2, " 5.4 "
" " " " " No. 4, " 5.9 "

Average cost per pound of live weight produced by feeding cooked meal to pigs Nos. 1 and 2, that were fed cooked meal and raw meal alternately in periods of four weeks, 5.45 cents. Average cost per pound of live weight produced by feeding raw meal to these pigs in this manner, 5.7 cents. Comparing results from Nos. 1 and 2, gives a percentage of 1.8 in favor of cooked meal.

Comparing result from feeding No. 3, cooked meal, twenty-four weeks without change, with those results from feeding No. 4, raw meal, in the same manner, shows a percentage of 166. in favor of raw meal. Compare the aggregate results from feeding cooked meal with the aggregate results from feeding raw meal, and the per cent. in favor of feeding raw meal is 85.5. This is the most emphatic answer yet given in this series of experiments. So far as the method of feeding is concerned, the results indicate that if the practice of alternating the kinds of food given is unfair, the error is in favor of the cooked meal.

The pigs Nos. 1, 2 and 4, were slaughtered and dressed Nov. 2d.

Weight of Pigs May 14.	Gain in live weight in 24 weeks.	Live weight of Pigs Nov. 2.	Dressed weight of Pigs Nov. 2.	Shrinkage.
No. 1, 24½ pounds....	143½ pounds.	168 pounds.	135 pounds.	33 pounds.
No. 2, 22 "	137 "	159 "	133½ "	25½ "
No. 3, 21½ "	21½ "	43 "	–	–
No. 4, 16½ "	112½ "	129 "	103 "	26 "

Experiment in planting potatoes.

The following experiments in planting potatoes has been continued since 1873. They were originated in connection with the Scientific Society of the Maine State College, in the expectation that the different methods would be tested by students on the college farm, and by farmers in other parts of the State; so that by comparison of results in different conditions and localities, definite conclusions may be reached, which shall be of real value to those seeking the best methods of planting potatoes.

The potatoes used for seed are classed as follows: Large, those weighing seven to eight ounces; medium, those weighing three to four ounces; small, those weighing one to two ounces.

Where not otherwise stated, large potatoes are cut into four pieces; medium potatoes are cut into two pieces; and one piece dropped in a hill. In each experiment ten hills are planted in rows three feet apart, and with the exception of No. 4, the distance between the hills is eighteen inches. This gives 1-968 of an acre to each experiment.

The experiment was this year conducted on the college farm, by A. L. Wellington, Class of 1880. The results reported by him were obtained from potatoes planted in a sandy loam soil, that had been in pasture many years before it was plowed and sown to turnips in the spring of 1875. In 1876 it was heavily manured and sown to oats; it was plowed again in October of that year. In May, 1877, it was dressed with cow manure, at the rate of five cords to the acre, and harrowed in. The potatoes were planted May 21–3, and were harvested the second week in September.

The results reported this year by G. O. Weston, were obtained from a "clay loam soil, plowed in the spring, and dressed with seven cords of green manure to the acre. Potatoes were planted June 2–4; were dug October 8th."

The average results of nine trials of these experiments are given in the last column of the following table. Four of these trials were made by G. O. Weston, a graduate of the State College, on his farm in Norridgewock; five of the trials were conducted by students on the college farm.

No. of Experiment.	Potatoes.	CONDITION OF EXPERIMENT.	Reported by A. L. Wellington.			Reported by G. O. Weston.			Average for nine trials.
			Large, lbs.	Small, lbs.	Total, lbs.	Large, lbs.	Small, lbs.	Total, lbs.	
1	Seed end.	Potatoes divided through the centre and the product of the seed end and the butt end compared.	22	3½	25½	10	8¼	18¼	17 5-9
	Butt end.		18½	1½	20	9	8	17	18 7-9
2	Large potatoes.	Large, medium and small potatoes compared; the seed planted each year to be the product of potatoes of a like class.	15	2¾	17¾	12½	6	18½	18
	Medium "		17¼	4¾	22	13¼	6	19¼	17 1-2
	Small "		15¼	5¾	21	9¼	6¼	15½	13 2-3
3	Large potatoes.	Large, medium and small potatoes compared; the seed to be selected from an ordinary pile of potatoes.	12½	3	15½	12	7¼	19¼	15 3-4
	Medium "		13¾	2½	16	11¼	7½	18¾	15 3-4
	Small "		15	3¾	18¾	11¾	7½	19¼	16 1-2
4	6 inches.	The product of large potatoes compared, when planted six, twelve, eighteen and twenty-four inches apart.	8¼	¾	9	6¾	7¼	14	14 1-2
	12 "		11	2¼	13¼	8¼	6	14¼	14 8-9
	18 "		17¾	3¾	21	12½	7	19½	15 7-9
	24 "		13¼	3	16¼	11	8¾	19¾	17
5	Large potatoes.	Equal weight, per acre, of large, medium and small potatoes, planted at equal distances.	25	1¾	26¾	12½	8	20½	20 2-9
	Medium "		15½	4	19½	9½	10½	19¾	18
	Small "		12	5½	17½	10¾	8½	19¼	17 2-9
6	2 inches.	Seed planted on the surface and covered to the depth of two, four, six and eight inches.	13	5¼	18¼	8¼	8¼	16½	16 5-8
	4 "		15	3½	18½	11½	9	20½	17 1-2
	6 "		11	5½	16½	13½	7	20½	14 1-2
	8 "		11¼	5¾	17	13¼	4	17¼	17

7	2 inches.	Seed planted below the surface two, four, six and eight inches, and covered to the same depth.	13½	3¾	17¼	8	7½	15½	15 1-3	
	4 "		10	4½	14½	8½	8	16½	15 2-3	
	6 "		14¾	4	18¾	10¾	9¾	20½	13 2-9	
	8 "		13	3¾	16¾	9¼	8	17¼	13 1-3	
8	One piece.	Medium potatoes cut to two parts and the product of one part in a hill, compared with two parts in a hill.	9	4½	13½	12	6¼	18¼	16 1-3	
	Two pieces.		9½	6½	16	13½	9¼	22¾	17 7-9	
9	Whole potatoes.	Medium potatoes planted whole, compared with the same cut to two eyes, and one piece planted in each hill.	5	4½	9½	9¾	8¼	18	15 7-9	
	Cut to two eyes.		6¾	2¼	9	9½	6½	16	15 8-9	
10	Flat hills.	The amount of potatoes produced by planting in flat hills, compared with the amount produced from pointed hills.	9½	4	13½	14	7½	21½	16 1-2	
	Pointed hills.		15¼	3½	18¾	11¾	9¾	21½	19	
11	Small hills.	The product of potatoes planted in small hills, compared with the product of potatoes planted in large hills.	10¾	3	13¾	16	9¾	25¾	16 1-6	
	Large hills.		12½	3	15½	14	8	22	17 1-9	
12	One piece.	Large potatoes cut to two pieces, the product of one piece in a hill compared with two pieces in a hill.	15¾	5½	21¼	16½	5¾	22¼	19 1-2	three trials
	Two pieces.		11	4	15	12	11¾	23¾	19	
13	Two stalks.	An equal number of eyes planted in each hill, and an equal number of stalks allowed to grow.	12¾	3	15¾	–	–	–	16	two trials
	Four stalks.		9	4	13	–	–	–	14 2-3	
	Six stalks.		15	5	20	–	–	–	20	
14	2 inches.	Seed planted at the ordinary depth, and covered to the depth of two, four, six and eight inches.	7	5	12	9¾	7½	17¼	14 2-3	three trials
	4 "		10¼	5¾	16	10¼	7¼	17½	16 1-2	
	6 "		15	4¼	19¼	11¼	7¼	18¾	18 5-6	
	8 "		11¾	3½	15¼	9¾	8	17¾	17	

It is evident that repeating these experiments tends to reduce differences in the results, and to make the averages more nearly alike. It is also evident that the figures in the column of averages, representing as they do nine trials of the experiment, cannot be considered chance results, but are worthy of some confidence as indicating the practical value of the several methods of planting. How great their value may be to the farmer, can be seen from a few examples.

Experiment No. 2 shows a loss of seventy bushels per acre from continued planting of small potatoes that were produced from small potatoes. No. 3 points to actual gain in using for seed small potatoes that were produced from large potatoes. It fairly indicates there is no danger of loss from the practice. The testimony of Nos. 5, 9 and 12, is against heavy seeding. No. 10 indicates that an acre planted with pointed or conical hills, will yield forty bushels more than if the hills were flat. Comparing the first condition of No. 5 with the third condition of No. 2, a difference of one hundred and six bushels is found in favor of the first method. The results in No. 4 represent in each condition of the experiment the product of ten hills, planted at unequal distances. To ascertain the yield of equal areas, multiply the first result by 3, the second by $1\frac{1}{2}$, and the fourth by $\frac{2}{3}$. This gives

Potatoes planted six inches apart,	43 lbs.
" " twelve inches apart,	29 7-9 lbs.
" " eighteen inches apart,	15 7-9 "
" " twenty-four inches apart,	11 1-3 "

Equal areas $\frac{1}{968}$ of an acre.

Product per acre of first condition,	694 bushels.
" " second condition,	480 "
" " third condition,	254 "
" " fourth condition,	183 "

Longer trial of the experiments will doubtless make the result still more reliable.

Experiment in the use of manures for top-dressing grass land.

The field in which the experimental plats are situated, is near the easterly corner of the farm. The surface is nearly level. The soil is a heavy undrained clay, of a remarkably even and unvarying character. It was last sown to grass in 1867, and has yielded a crop of hay each year since that time. The portion of the field devoted to the experiment has received no other fertilizers than those here indicated.

The experimental plats are two rods square, each one containing one-fortieth of an acre. They are staked out in two rows, four plats in a row, and are separated from each other by a strip of land four feet wide, which received no manure.

The manures were first applied May 20th, 1873, and the grass was cut the second week in July.

In 1874, manures, similar in kind and quantity to those used the previous year, were applied to the same plats May 22d; the grass was cut July 29th.

In 1875, no top-dressing was used; the plats mowed July 26th.

In 1876, no top-dressing was applied; the plats were mowed July 19th.

This year the plats were mowed July 10th, no manure having been applied.

The weight of the hay gathered from those plats in 1873, the first year of the experiment, indicates that the manures had no effect to increase the crop of that year, since the plat marked "Nothing" produced as much as any of the plats, and more than some of them.

Assuming it to be true that the crop harvested in 1873 was in no way influenced by the manures, and assuming also, that the natural exhaustion of the soil, and the effect of other natural causes, such as favorable or unpropitious seasons, are fairly indicated by the plat marked "Nothing," a calculation is given to show the amount of increase per acre obtained from these manures, and the cost per ton of such increase.

In working out these results the expense of applying the manure is included in the sum, given as the cost of the manure. As the manures were applied two years in succession, the full quantity put on the plats was double that given as the yearly application in the table below.

MANURES.	Cow manure, 5 cords per acre.	Horse manure, 5 cords per acre.	Fine old muck, 5 cords per acre.	Fine old muck, 5 cords; salt, 3 bush. per acre.	Plaster, 2 bushels per acre.	Wood ashes, 5 bushels per acre.	Salt, 3 bushels per acre.	Nothing.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs
1873. Weight of hay.	63	71	83	73	51	81	87	87
1874. "	150	127	148	121	115	97	92	88
1875. "	182½	152	117	108	79	103	101	88
1876. "	122	102	76	67	33	56	43	46
1877. "	75	50	45	35	30	35	25	40
Value per cord or bush of manure applied..	$5 p.cd.	$5 p.cd.	$2.50 p.cd.	$2 50 p.cd. 33⅓ p.bu.	50 p.bu.	25 p.bu.	33⅓ p.bu.	
Cost per ton of gain in hay.....	7 41	11 52	9 19	12 16	0 98	2 66	no value	

Several farm crops have been grown with the Stockbridge manures, and tests made to learn the efficiency of the fertilizers. One acre of ruta-bagas, dressed with the Stockbridge formula for turnips, produced 756¾ bushels. Three rows, containing one-tenth of an acre, were left without manure, for comparison. The unmanured plat produced at the rate of 243¼ bushels per acre, a difference of 513½ bushels per acre, for which the Stockbridge manure must receive credit.

The cost of manure for one acre, freight, cartage and cost of sowing included, was $27.00. Cost of increase in crop, 5½ cents per bushel. These ruta-bagas were grown on part of an exhausted mowing field, turned under the previous autumn. It had great variety of soil—clay loam, sandy loam, gravel and drained peaty soil. After the ground had been well prepared, the manure was sown broadcast and harrowed in. The surface was then thrown into ridges three feet apart, with Chandler's Horse Hoe. These were leveled and made free from lumps with the hand rake, and four pounds of seed

to the acre were sown June 14th, with Comstock's Seed Sower. The seed came up well on both parts of the field. Many of the plants on rows without manure perished from drouth, or were destroyed by insects, leaving fewer than were needed to cover the ground. The plants on the manured land suffered but little from either cause.

One-fourth acre of wheat, on clay loam soil, was manured with the Stockbridge Formula for wheat. A plat was left without manure, for comparison, and an equal area was dressed with old manure from the cow stable, four cords to the acre.

	Per acre.	Gain per acre.	Cost of gain per bushel.
No manure produced.....	13 1-2 bushels,	–	–
Cow manure produced.....	17 1-2 "	4 3-10 bushels,	$4 65
Stockbridge formula produced	34 2-3 "	21 7-15 "	86½

The relative value of the two manures used in the experiment is not shown by the cost per bushel of the gain in wheat given above. To determine that point, regard must be had to the future crops of grass that will be grown on the plats. Such tests will undoubtedly make a more favorable showing for the cow manure.

An experiment in growing corn with the Stockbridge manure, was conducted by P. Keyes, Jr., Class of 1880, and reported by him at the Farmer's Convention in Alfred, Oct. 16–20. A portion of his report is given here.

The ground on which this experiment was tried, is a sandy loam; slopes toward the west, rendering the drainage quite complete. It was broken from the sward in April, 1876, and lightly dressed with manure from the sheep pens, then sown to oats. In the autumn following, the ground was again plowed, and also in the spring of 1877, the turf being well broken by harrowing. The witch-grass roots, of which the ground was full, were raked and hauled off, then half of the fertilizer used was sown broadcast, and harrowed in with Share's cultivator harrow. The furrows were made length-

wise the piece, with Chandler's horse-hoe, leaving the rows three feet and a half apart; then a light marker, with teeth two feet apart, was drawn at right angles with the furrows. At each of the points of intersection, five kernels of corn were planted, covered with about two inches of soil. This was done from the 15th to the 18th of May.

About half the field of corn was planted with seed sent to President Allen from New York State, by Mr. C. H. Curtis, known in that vicinity as "Red Glazed Yellow," having been cultivated for thirty years—the earliest selected each year for seed, for the purpose of obtaining thereby an early variety. This corn ripened nearly two weeks earlier than did the corn on the other half, the seed of which came from Nobleboro, sent by L. H. Winslow. The corn came up quickly, and presented a dark green appearance; numerous hills were tinged with dark purple, the cause of which is not known. The remainder of the fertilizer was applied, one-half, the 23d of June, and the other half in July, each application being made by hand; the fertilizer was strown between the rows and hills. It was necessary in order to keep down the witch-grass, to make frequent use of the hoe and cultivator. In this way the land was thoroughly stirred and kept from weeds.

A piece of ground planted beside the one just described, received no fertilizer, and will show by comparison the increase where fertilizer was used. The weight of corn raised from the seed from New York, where fertilizer was applied, was on an average 5,850 lbs., or about 61 bushels of shelled corn per acre; where no fertilizer was used it was on an average 4,633 lbs., or nearly 49 bushels. The weight of corn harvested from the seed sent by Mr. Winslow, where fertilizer was applied, was at the rate of 5,639 lbs., or 59 bushels per acre; the same without fertilizer, produced 3,807 lbs., or 40 bushels per acre. The average yield where fertilizer was applied, was 5,720 lbs., or 60 bushels per acre; where no fertilizer was used the yield was 4,221 lbs., or 44 bushels. The gain per acre where fertilizer was applied, over

that where none was used, was 1,511 lbs., equal to nearly 16 bushels. The tops were weighed, and found to be about 74 ounces heavier where fertilizer was applied than where none was applied. The quality of the corn grown with fertilizer was decidedly superior to that grown without, being better ripened, so that a part of the weight of the unmanured corn is due to its unripe condition, making the actual increase not less than 20 bushels per acre.

Considering the butts to be in the same proportion where fertilizer was used, regarding weight, the value of the stover would be at least three-fourths more where fertilizer was applied. Reckoning the weight, per acre, of stover where no fertilizer was used to be two tons, and this worth six dollars per ton, we have a gain of nearly nine dollars on the stover by using fertilizer. The cost of fertilizer per acre was twenty-two dollars; this less the gain on the stover above the natural yield, leaves thirteen dollars as the cost of the sixteen bushels gained. This shows the cost per bushel to be about sixty-five cents.

The ground was regarded as in a poor condition when plowed, producing less than a half ton of hay per acre, and it is a wonder why it produced so much corn without fertilizer. On ground possessing less natural corn-producing qualities, the gain from using the fertilizer would doubtless have been more marked than shown by the present experiment.

A series of experiments has been commenced this year, the object of which is to ascertain the effect, if any, that cutting grass at different times, as early or late in the season, has upon the quality and quantity of the crop. It is intended that the experiments shall be continued on the plats that were mowed this summer, until the hay producing power of the land is reduced to a low degree, in order that the effect of cutting the grass at different times in the haying season shall be made quite evident.

The plats are located in field No. 1, which lies along the town road next to the southerly line of the farm. The land was manured and cultivated with field crops in 1874–5,

having been sown to grass in the latter year. The catch of grass from this sowing was not good, and grass seed was again sown on the land in April, 1876. This gave a good sod as the yield of the plats shows. An area of one acre, eight by twenty rods, is divided in the direction of its greatest length into eight plats, each one containing one-eighth of an acre. These plats are marked in two equal divisions. Each division containing four plats. In the future treatment of the experiment, two plats, one from each division, will be cut at the same time; that by obtaining results in each condition of the experiment from plats somewhat separated from each other, we may counteract, in part, the errors arising from natural inequality of soil and fertility. The results obtained from the experiment this year would be more satisfactory if the grass on all the plats could have been cut and weighed on the same day; but, with our limited and primitive means for weighing, this was impossible. The results given below were obtained and reported by A. M. Farrington, a graduate in the class of 1876.

No. of division.	Description of plat.	Weight of green crop.	Weight of hay.	Per cent. of loss in drying.
I.	a, I,	1,377 lbs.	551 lbs.	59.98
	b, I,	1,215 "	554 "	54.43
	c, I,	1,384 "	502 "	63.74
	d, I,	1,256 "	498 "	60.35
II.	a, II,	1,263 "	476 "	62.44
	b, II,	1,173 "	465 "	60.35
	c, II,	1,154 "	479 "	58.49
	d, II,	1,136 "	508 "	55.29
Total	.....	9,958 lbs.	4,033 lbs.	

Average weight of green crop, 1244.78 lbs.
" " dry crop, 504.125 lbs.
" per cent. of loss in drying, 59.44

Plat b, I, had become partly dry before it could be weighed. Plats c, II, and d, II, contained more herds-grass and less clover than other plats.

Experiments to ascertain what elements of plant food are wanting in the soil.

These experiments are part of a series proposed by Prof. W. O. Atwater, Director of the Connecticut Agricultural Experiment Station, in his report for January, 1877. Their scope and intent are thus set forth in that report:

"One of the main results of the vast amount of work done in field experiments with fertilizers, is the clear demonstration that soils vary greatly in their capabilities of supplying food to crops; that different ingredients are deficient in different soils; and that the results of any given experiment are in the main applicable only to the particular soil on which it is made. The chief object of commercial fertilizers is to supply the plant-food which the crop needs and the soil fails to supply. To use them economically, then, we must know what materials are deficient in the soil where they are to be applied. The most sensible method for determining what are the deficiences of soils and how they will be most economically supplied to given crops is to put the question to the soil with different fertilizing materials and obtain its reply in the crops produced."

To bring it within the power of farmers to test the wants of their soil at slight expense, small bags of different fertilizing materials were prepared by the Connecticut Experiment Station and sent to those desiring them, at a cost of $4.00 for each experiment. Two sets of these bags were procured for the experiments here reported. The fertilizers were alike in both cases, therefore only the results are given in the second experiment.*

The first experiment was conducted and reported by G. W. Lufkin, class of 1880; the second by F. W. Powers and C. W. Nash, class of 1880.

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* Both experiments clearly indicate that Phos. Acid is the fertilizing element more evidently lacking than any other, in the soils tested.

Experiment No. 1.

The spot selected for this trial, was situated a little to the south of the new barn. Soil, a sandy loam. From the time it was cleared till it was broken up in the fall of 1874, it had been pastured. In 1875 it was summer tilled, and in the spring of 1876, received a light dressing of stable manure, and was sowed to a mixture of wheat, oats and barley. This spring, 1877, it received a light coat of stable manure, which was thoroughly cultivated in. After plowing, the ground was divided into strips 22 rods long by three feet wide, equal to 1-40 of an acre; between each two plots was a space sufficient for a single drill. A drill was then made lengthwise of the plots, and the fertilizers were sown on the sides and bottom of the drills, and thoroughly incorporated with the soil by the use of garden rakes. Plot No. 1 received 20 lbs. dried blood, containing 10.5 per cent. nitrogen; No. 2, 20 lbs. dissolved bone black, containing phosphoric acid, 15 per cent. soluble; No. 3, 20 lbs. chlorate of potassium, containing actual potash, 52 per cent.; No. 4, 10 lbs. each of dissolved bone black and dried blood, containing phosphoric acid, 7.5 per cent., and nitrogen, 5 per cent.; No. 5, $6\frac{2}{3}$ lbs. each of dried blood, dissolved bone black, and chlorate of potassium, containing nitrogen, 33 per cent., phosphoric acid, 5 per cent., and potash, 17 per cent.; No. 6, sulphate of lime, furnished by 20 lbs. land plaster; No. 7, 20 lbs. kainite, or sulphates of lime and magnesia; No. 8, 20 lbs. Bradley's Superphosphate; No. 9, 20 lbs. Cumberland Superphosphate, and No. 10, 20 lbs. Rafferty & Williams' Superphosphate. All the fertilizers were applied at a uniform rate of 800 lbs. to the acre. Each plot was divided into 3 equal parts, designated as sections A, B, C. Section A of each plot was planted to Early Rose potatoes; B, to yellow-eyed beans, and C was sown to ruta-bagas. Each unmanured plot was planted to correspond to the manured ones. The planting was done between June 7th and 9th.

Through the growing season, the nitrogen and phosphoric

acid seemed to do best on the potatoes and beans. On the ruta-bagas, the phosphoric acid and the mixture of phosphoric acid and nitrogen did finely, while on those plots where the nitrogen and potash were used separately, the plants grew well till the middle of July, when for some cause or other they came to a complete stand-still. The potatoes were dug the 8th of September.

The following table gives the results of this experiment:

FERTILIZER.	Yield in weight.		Gain in yield over unmanured plots.		Cost of manure per acre.	Market value of increased product.
	lbs.	oz.	lbs.	oz.		
Nitrogen	61	8	33	$\frac{1}{3}$	$20 00	$49 50
Phosphoric acid	86		57	$8\frac{1}{3}$	21 00	86 40
Potash	52		23	$8\frac{1}{3}$	26 00	35 10
Nitrogen and phosphoric acid	79	12	51	$4\frac{1}{3}$	21 50	76 80
Nitrogen, phosphoric acid and potash	77		48	$8\frac{1}{3}$	22 33	72 80
Plaster	56	2	27	$10\frac{1}{3}$	6 00	40 78
Kainite	36	12	8	$4\frac{1}{3}$	18 00	12 30
Bradley's Superphosphate	82	8	54	$\frac{1}{3}$	22 00	81 00
Cumberland Superphosphate	79		50	$8\frac{1}{3}$	22 00	75 90
Rafferty & Williams' Superphosphate	63	7	34	$8\frac{1}{3}$	22 00	51 90
Unmanured	28	$7\frac{2}{3}$	–		–	–

In this table the cost of applying the fertilizers is estimated at $2.00 per acre; market value of the potatoes, 75 cents per bushel. By examination, it will be found that the market value of increased production is greatest under phosphoric acid. Of the mixed fertilizers, nitrogen, and of the superphosphates, Bradley's, give the best results. Value of increased production is least under kainite. The greatest net gain from the use of fertilizers, phosphoric acid, $65.40 per acre; the least, potash, $9.10; while kainite shows a net loss of $5.70 per acre.

The beans were picked September 14th, and after being thoroughly dried, were threshed and weighed; the vines were pulled, and after drying were also weighed. The following table gives results:

FERTILIZER.	Yield in weight.		Gain in yield.		Cost of manure.	Value of increased product.	Value of loss in product.
	Beans.	Vines.	Beans.	Vines.			
	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.			
Nitrogen	1 10	2 14	—3	—1 5	$20 00	–	$16 09
Phosphoric acid	9 10	9	5	4 13	21 00	$27 60	–
Potash	2 2	3 5	—2 8	—14	26 00	–	13 24
Nitrogen and phosphoric acid	8 2	8 7	3 8	4 3	21 50	19 62	–
Nitrogen, phosphoric acid and potash	6 8	7 2	1 14	2 15	22 33	10 75	–
Plaster	6 2	6 1	1 8	1 14	6 00	8 43	–
Kainite	4 10	3 8	–	—14	18 00	–	25
Bradley's Superphosphate	8 6	7 8	3 12	3 5	22 00	20 59	–
Cumberland Superphosphate	8 6	6 8	3 12	2 5	22 00	20 23	–
Rafferty & Williams' Superphosph'te	8 12	7 2	4 2	2 15	22 00	22 39	–
Unmanured	4 10	4 3	–	–	–	–	–

The market value of the beans is estimated at $2.75 per bushel of 67 lbs. The market value of increased production is greatest under phosphoric acid. Of the mixed fertilizers, nitrogen and phosphoric acid give the best results; of the superphosphates, Rafferty & Williams'. Nitrogen, potash and kainite show a loss in production. The greatest net gain from the use of fertilizers, phosphoric acid, $6.60; the least, Rafferty & Williams' Superphosphate, $0.39. The greatest net loss, potash, $37.24; the least, Bradley's Superphosphate, $1.41. The increased product from any of the fertilizers, except phosphoric acid, plaster and Rafferty & Williams' Superphosphate, was not enough to cover their cost. The whole crop was not up to the standard, and it was hardly a fair experiment.

The ruta-bagas were harvested October 5th. The following are the results. As plots 1 and 3 failed to come to maturity, they have been omitted:

FERTILIZERS.	Yield in measure.	Gain in yield over unmanured plots.	Cost of manure per acre.	Value of increased production.
Phosphoric acid	3 bush. ½ pk.	2 bush. 1½ pks.	$21 00	$63 60
Nitrogen and phosphoric acid	4 bush. 1 pk.	3 bush. 2 pks.	21 50	104 40
Nitrogen, phosphoric acid and potash,	4 bush. 1 pk.	3 bush. 2 pks.	22 33	104 40
Plaster	2 bush. 1½ pks.	1 bush. 2½ pks.	6 00	49 20
Kainite	2 bush. 3 pks.	2 bushels.	18 00	60 00
Bradley's Superphosphate	3 bush. 3 pks.	3 bushels.	22 00	90 00
Cumberland Superphosphate	3 bush. 2 pks.	2 bush. 3 pks.	22 00	82 80
Rafferty & Williams' Superphosphate.	2 bush. 2 pks.	1 bush. 3 pks.	22 00	52 00
Unmanured	3 pks.	–	–	–

Value of turnips per bushel, 25 per cent. The market value of increased production is greater under the two mixed fertilizers; while of the superphosphates, Bradley's gives the best result; it is least under plaster. The net gain from the use of fertilizers is greatest under nitrogen and phosphoric acid, $82.70; the least under Rafferty & Williams' Superphosphate, $30.80. With the exception of plots 1 to 3, this was a very satisfactory experiment.

By comparison of the several tables, it will be seen that phosphoric acid gives the best result, except in the case of ruta-bagas, where nitrogen and phosphoric acid is best. As a general thing all those fertilizers containing phosphoric acid succeeded finely. As the ground on which the experiment was performed was old pasture land, we may safely conclude that a large part of the phosphoric acid of the soil has been carried away in milk and bones of the cattle which grazed there. Considering the cheapness of plaster, it gives a fair result, while nitrogen and potash seem to be of but little value. Of the superphosphates, Bradley's seems to be best for potatoes and ruta-bagas, and Rafferty & Williams' for beans. It is, however, only by carrying these experiments through a series of years, and comparing results, that we can hope to learn the true needs of the soil.

Experiment No. 2.

The soil was sandy loam. The land had been in mowing for many years, and had for seven years at least received no manure, except in the spring of 1874, when gypsum at the rate of three bushels to the acre was sown on the field. It was plowed in October, 1876. The potatoes were planted May 28th and harvested September 9th. The amount of seed used was seven bushels to the acre.

No. of plat.	KIND OF FERTILIZER.	Yield in weight.	Gain in yield over unmanured plat.	Cost of manure applied, per acre.	Market value of increased production per acre.
1	Nitrogen	286 lbs.	151 lbs.	$7 20	$16 10
2	Phosphoric acid	360 "	225 "	6 40	24 00
3	Potash	182 "	47 "	9 60	5 00
4	Nitrogen and phosphoric acid	287 "	152 "	6 80	16 20
5	Nitrogen, phosphoric acid and potash	395 "	260 "	7 73	27 73
6	No manure	135 "	–	–	–

On plats Nos. 2 and 5 the tops were large and of good color. No. 1 had tops somewhat smaller and tinged with yellow. On No. 3 the tops were quite small and of a bright deep green. Tops on No. 4, average; No. 6, feeble.

Experiment in Cultivating the Sugar Beet. By D. S. Jones, Dennysville.

The plat of land taken for the experiment was a piece on which strawberries had been grown for several years. It has a slight easterly slope, and the soil is a sandy loam. The land was deeply plowed the 20th of May; it was then well pulverized and the stones and lumps of earth raked off. The plats were staked off, each two feet square, lying in pairs. May 24th the fertilizers were applied. These were carefully reckoned and weighed separately, then mixed and applied broadcast as evenly as possible, each plat of the pairs receiving the same kind and quantity. Those applied on the first two pairs, No. 1 and 2, 3 and 4, were raked into the soil with a garden rake. The barnyard manure on No. 5 and 6 was worked into eight or ten inches of soil. The second part of those applied in No. 7 and 8, were worked into the soil about ten inches deep, while the first part was raked into the surface. The last pair received no fertilizer. May 25, the first plats of each pair, numbers, 1, 3, 5, &c., were marked by lines drawn eight inches apart lengthwise and crosswise; and the second plats, numbers 2, 4, 6, &c., by lines drawn ten inches lengthwise and twelve inches crosswise. The seeds

were dropped at the intersection of these lines. Each of the ten plats was divided into three equal sections marked A, B and C, making thirty sub-plats. On A was planted Vilmorin's French White Sugar Beet; on B, Vilmorin's Improved (Imported) Sugar Beet; on C, Carter's Prize Nursery Sugar Beet. Two seeds were dropped at each intersection, and covered by hand. They germinated well in all but the first and second plats, where many did not germinate. About the first of July all the vacant places were filled by plants transplanted from the same sub-plat, and soon after they were thinned out, leaving the beets on numbers 1, 3, 5, 7 and 9, eight by eight inches apart; and in numbers 2, 4, 6, 8 and 10, ten by twelve inches. Thus there were *five* different fertilizers applied, *three* varieties of beets, and *two* methods of cultivation, making thirty different results. Nothing further was done except to keep the plants free from weeds, until they were harvested October 6th. The beets from each sub-plat were carefully weighed—first the roots and tops together and then the roots alone. In plat No. 1, the tops weighed the same as the roots, in other plats the tops varied from being equal, down to three-fourths of the weight of the roots. In the figures below the results given pertain to the roots only.

On the first pair, No. 1 and 2, nitrate of soda, containing 15.5 per cent. of nitrogen was applied, at the rate of 500 lbs. to the acre, or 77.5 lbs. of nitrogen.

On the second pair, No. 3 and 4, sulphate of ammonia, containing 20 per cent. of nitrogen was applied, at the rate of 400 lbs. to the acre, or 80 lbs of nitrogen.

On the third pair, No. 5 and 6, barnyard manure was applied at the rate of ten cords to the acre.

On the fourth pair, No. 7 and 8, sulphate of ammonia at the rate of 200 lbs. to the acre was worked deep into the soil, to be taken up by the plant in the later stage of its growth, and nitrate of soda at the rate of 230 lbs. to the acre was left near the surface, to be taken up by the young plant. The amount of nitrogen, 76 pounds per acre, was

about the same as that applied in the first two pairs. On the fifth pair no fertilizer was applied.

The average product of beets per acre from No. 1 and 2, where nitrate of soda was applied, 40,075 lbs.

No. 3 and 4, where sulphate of ammonia was applied, 45,302 lbs.

No. 5 and 6, where barnyard manure was applied, 43,778 pounds.

No. 7 and 8, where sulphate of ammonia and nitrate of soda were applied, 48,787 lbs.

No. 9 and 10, where nothing was applied, 47,262.

The large yield where nothing was applied may in part be accounted for from the fact that this pair of plats was the lowest, and received the wash from those above.

Experiments have shown that in order to get the full benefit of barnyard manure, it should be applied the year before the beets are grown; and that the sugar is not so easily obtained from the beets grown with this dressing as from those where commercial fertilizers are used.

In regard to the varieties, we find the best average yield per acre was Carter's Prize Nursery, 61,298 lbs.; Vilmorin's French White yielded 39,144 lbs.; Vilmorin's Improved yielded 34,439 lbs.

The average weight of each beet,

	Planted 8 by 8 in. apart.	10 by 12 in.	Average.
Carter's,	9 1-2 oz.	16 8-9 oz.	12 1-10 oz.
Vilmorin's,	6 8-25 oz.	10 2-5 oz.	7 4-5 oz.
Vilmorin's improved,	5 8-25 oz.	9 6-11 oz.	6 5-6 oz.

The Carter's Prize Nursery gave the largest yield per acre. Although these beets are larger, they are not generally so handsome in shape as the other varieties.

The average yield per acre of those planted 8 by 8 inches apart was larger by 1,642 lbs. than where they were planted 10 by 12 inches apart, the larger number of roots more than compensating for the inferiority in size.

Six of the medium sized beets were selected from each of the sub-plats and packed in sand, to be analyzed by the Pro-

fessor of Chemistry in the college laboratory. The percentage of sugar contained in each will be reported in due season.

Farm Implements.

An Osborn Sulky Plow, manufactured by Gregg & Co., Trumansburg, N. Y., was sent for trial, by Hon. Fred Atwood of Winterport. Our impressions from only seeing the machine, were against it. It seemed to promise too much and the working arrangements appeared too complicated. The trial we made of it entirely changed our views. Although apparently intricate in its parts, it is really simple in construction and easy to control in working.

The plow was used on light loam land, somewhat stony and full of witch-grass. The surface was strown with the tops of potatoes recently dug.

Notwithstanding these difficulties in the character of the land, and our want of experience in using the plow, more land was plowed and the work was done in a better manner than would have been accomplished with a common plow in the same time.

By a simple and effective arrangement of levers, the driver is able to control the running depth of the plow, to throw it out of the ground to free it from roots and avoid large stones, and then return it to the furrow again without leaving his seat and with no more exertion than is required to handle the lever of a mowing machine. The whippletrees and chains by which the team is attached to the plow, are fastened to and supported by the axle and pole of the plow, and are in this way kept from dragging under the horses' feet, and becoming entangled, as they frequently do in using the common plow. The saving of time and patience by this feature alone, is a strong point in its favor. We found this plow in many respects greatly superior to the one in general use, and in no one point did we find it inferior to that.

J. E. Lewis, Worcester, Mass., manufacturer of the Peerless Corn Sheller, has given one of those machines to the

farm. We have used it with entire satisfaction. The machine is made wholly of iron, is simple, and apparently durable. While a child can operate it with ease, it has a working capacity sufficient to profitably employ the time and strength of a man. By means of a mechanical movement, claimed to be entirely new, it adapts itself to ears of any size, and takes the corn clean from the cob.

FARM CROPS.

Hay,	85 acres,	100 tons.
Potatoes,	4 "	465 bushels.
Ruta-bagas,	1.1 "	800 "
Beets for stock,	1.1 "	700 "
Corn,	1 "	60 "
Barley,	12 "	186 "
Oats and peas,	2 "	16 "
Wheat,	6 "	40 "
Fodder corn,	1.3 "	Excellent crop.
Millet,	1 "	Fair yield.
South Garden,	1.5 "	Garden vegetables.

One and one-fourth acres of the potatoes were of the Early Rose variety, and were grown on dry, sandy loam, that was well filled with witch-grass. Their cultivation involved an immense amount of labor for which the crop gave no adequate compensation. A portion of this land after it has been cultivated and enriched another year, will be taken for planting an aboretum, under the care of Prof. C. H. Fernald. It was chiefly to fit it for this use that its cultivation was attempted.

The remaining two and three-fourths acres were grown on a portion of the same field with the ruta-bagas, and presented an equal variety of soil—clay loam, sandy loam, gravel, and drained peaty soil. These potatoes were planted in May, and grew fairly through the severe drought of June and July. During the warm, wet weather in August the tops were killed by rust, and the growth of the potatoes was stopped.

Only a small portion of the tubers, those on the more moist parts of the field, were affected with rot.

Ten acres of the barley were sown on old mowing land that has for eight years been pastured by sheep. The field lies nearly level, and the soil is a close brick clay. When plowed, the latter part of May and the first week in June, the surface was quite dry, and turned up in hard clods. These were reduced by the persistent use of the farm roller and Randall's harrow, and a finely pulverized seed bed prepared for the grain. The barley was sown June 15 to 19, and covered with Share's harrow, followed by Thomas' smoothing harrow. There was not sufficient moisture in the soil to germinate the seed; but a small portion of it therefore came up, and this had a feeble, unsatisfactory growth.

The oats and peas were sown May 15th, on well prepared land of average fertility. That the yield was so small must be from the severity of the drought. The failure of the wheat crop must be ascribed to the same cause. The land on which it was sown was under cultivation last year, and received a liberal dressing of cow manure. Four cords to the acre of the same quality of manure was spread this year and harrowed in before sowing the wheat. All our experience in previous years has pointed to late sowing as the safer practice. In accordance with this experience, the wheat was sown June 9th with the result as given. In this case the teaching of experience was at fault, as early sown wheat has in this vicinity given good returns. The damage from drought is not fully represented by the smallness of the grain crop. The grass seed failed to grow. There is, therefore, the additional loss of the grass seed sown on eighteen acres, and of the crop of grass expected from it next year.

Farm receipts and expenditures for each month of the year ending November 30, 1877.

Year.	Month.	Receipts.	Expenditures.	Excess of Receipts.	Excess of Expenditures.
1876.	Dec.,	$269 84	$222 41	$47 43	–
1877,	Jan.,	246 26	214 20	32 06	–
"	Feb.,	307 98	184 32	123 66	–
"	March,	198 99	294 55	–	$95 56
"	April,	243 69	356 85	–	113 16
"	May,	237 83	231 88	5 95	–
"	June,	80 31	765 87	–	685 56
"	July,	445 66	681 80	–	236 14
"	August,	216 22	212 31	3 91	–
"	Sept.,	235 68	264 82	–	29 14
"	Oct.,	392 09	347 36	44 73	–
"	Nov.,	374 81	671 82	–	297 01
		$3,249 36	$4,448 19	$257 74	$1,456 57

Excess of expenditures above receipts, $1,198.83.

Receipts for farm labor, produce, &c., for the year ending November 30, 1877.

Labor of students, farm hands and teams	$1,031 52
Board of workmen on new farm-house and others	129 97
Stock sold	188 50
Hay sold	122 55
Pork, beef and mutton	198 21
Milk	373 68
Butter	128 03
Pigs	94 25
Lumber	177 45
All other farm produce	830 61
	$3,274 77

Expenditures for labor on farm, for groceries, meats and fish, board of family and hired help, corn and fine feed for stock, for hired help in house, &c., &c.

Labor of farm hands	$728 61
" of students (term work)	673 26
" " in haying and vacation	258 69
" of all others on farm	145 99
" of men hired to grade grounds around new farm buildings	62 00
" cutting cord wood and peeling bark	132 89
" clearing land	181 35
" hired help in house	198 97
Groceries and provisions for board of family and hired help	559 42
Meats for board of family and hired help	114 29
Fish " " "	29 01
Meal, corn and fine feed for neat stock and swine	559 42
Blacksmith's and wheelwright's work	144 74
Farm machines, implements and hardware	141 45
Fertilizers and seeds	242 93
Harness repairs and team furnishings	30 93
House furnishing	63 07
Stock	123 50
Sundries	83 08
	$4,473 60

Permanent improvements, additions to farm stock and implements and cost of experiments.

Improvement of pastures	$281 85
30 rods new fence	40 00
Clearing and plowing three acres new land	75 00
Farm tools and machines	45 00
Making road by new farm buildings	35 00
Improvement of land in front of new farm buildings	20 00
Improvement of field No. 7, by drains and filling	65 00

25 cords hemlock bark in woods		$125 00
25 M. hemlock logs in woods		50 00
80 cords of wood in excess of last year		160 00
Cost of experiments		315 00
Increased value of stock		46 00
		$1,257 85
Excess of expenditures over receipts	$1,198 83	
Salary of assistant farm superintendent	400 00	
		$1,598 83
Permanent improvements, additions to farm stock, implements, &c		1,257 85
Deficit for the year ending Nov. 30, 1877		$340 98

Considered from a financial standpoint alone, the exhibit here submitted may not be called a successful one. The expenditures exceed the receipts by several hundred dollars.

Several causes beyond control, have influenced this result. The severe drouth that continued through the months of June and July, cut short and nearly destroyed our pastures, making it necessary to furnish a large part of the food for the neat stock from the barn. Purchases of meal and shorts for this purpose add largely to the expenditures. From the same cause, the cost incurred for the improvement of pastures and meadow lands failed to give fair returns, so that for money expended for that purpose only partial credit is given in the account. The shrinkage in value of the stock, an inevitable result of hard times, and the loss by disease of the Shorthorn cow, Duchess of Lakeside, help to increase the deficit.

If in managing the farm its highest capabilities as an educational appliance of the college shall be kept in view, it does not seem probable it can ever be made to be permanently a source of revenue. It would appear rather, that to make it a means of income should be deemed sure evidence of misdirection in its use, since this can only be done by diverting it from the higher and more valuable purposes for which it was intended.

Names and value of Stock on farm of Maine State College.

Shorthorn cow Cornelia, 11 years old	$150 00
" heifer Cornucopia, 3 years old	125 00
" " Duchess of Maine, 3 years old	150 00
" " calf Cornucopia 2d, 3 months old,	25 00
" bull Napoleon 3d, 2 years	150 00
" " Dirigo, 19 months	50 00
" bull calf Duke of Maine, 3 months old	25 00
Ayrshire bull, Hiempsal, 4 years old	125 00
" cow Olee, 6 years old	200 00
" " Isabel, 7 years old	150 00
" " Olivia, 3 years old	140 00
" " Oleeannee, 2 years old	85 00
" " Oletta, 15 months old	70 00
" heifer calf Olivia 2d, 5 months old	35 00
" " Isabel 2d, 3 months old	35 00
Jersey bull Harry, 2 years old	75 00
" bull calf Harry 2d, 6 months old	30 00
" " Prince Peter 2d, 6 months old	25 00
" cow Hebe, 11 years old	250 00
" " Pride of Lachine, 8 years old	200 00
" heifer Hepsy, 3 years old	200 00
" " Pride of the Island, 17 months old	65 00
" " Hester Hart, 17 months old	75 00
" calf Helen, 10 months old	50 00
Grade Shorthorn heifer, Maggie 3d, 3 years old	65 00
" Ayrshire " Jennie, 19 months old	35 00
" " " Gipsey 2d, 19 months old,	40 00
" Jersey cow Maggie, 8 years old	70 00
" " " Topsy, 7 years old	100 00
" " " Gipsey, 5 years old	70 00
" " " May, 3 years old	65 00
" " heifer Topsy 2d, 17 months old	45 00
" " " Topsy 2d, 10 months old	25 00
One two years old steer	20 00
	$3,020 00

Horses.

Dick, 13 years old	$175 00
Louis, 12 years old	150 00
Robin, 10 years old	250 00
Nell, 11 years old	300 00

Sheep.

1 Cotswold buck	20 00
2 " ewes	18 00
1 " lamb	8 00
29 Grade Cotswold sheep	116 00
13 " lambs	39 00
2 South Down ewes	10 00
3 Grade South Down ewes	12 00

Swine.

1 White Chester boar	35 00
4 " breeding sows	120 00
13 shoates	40 00
4 fat hogs	100 00
	$1,393 00
Neat stock	3,020 00
Total	$4,413 00

Inventory of Farm Tools and Equipments.

1 Sward Plow with Subsoil Attachment.
1 Subsoil Plow.
4 Sward Plows.
4 Stubble Plows.
1 Charter Oak Swivel Plow.
1 Light one-horse Plow.
1 Garden Plow.
1 Furrow Plow.
1 French's Cultivator.
1 Nishwitz's Pulverizer.
1 Share's Coulter Harrow.
2 Scotch Harrows.
1 Chase Revolving Tooth Harrow.
1 Burnt Land Harrow.
1 Powels' Wheel Harrow and Grain Coverer.
1 Thomas' Smoothing Harrow.
1 Randall's Harrow.
1 Chandler's Improved Horse Hoe.
1 Share's Horse Hoe.
1 Farm Roller.
1 Farm Scraper.
2 Stone Drags.
1 Clipper Mower.
1 Warrior Mower.
1 Superior Hay Spreader.
1 Bay State Horse Rake.
1 Yankee Horse Rake.
1 Whittemore's Horse Rake.
10 Long Handle Shovels.
4 Short Handle Shovels.
2 Long Handle Garden Spades.
2 Short Handle Garden Spades.
4 Spading Forks.
6 Manure Forks.
3 Garden Trowels.
18 Garden Hoes.
6 Potato Diggers.
1 Grubbing Hoe.
4 Garden Rakes.
10 Grass Scythes.
10 Scythe Snaths.
1 Grain Scythe.
3 Bush Scythes.
15 Hay Rakes.
3 Drag Rakes.
20 Hay Forks.
1 Hay Knife.
1 Hay and Straw Cutter.
1 Fanning Mill.
1 Root Cutter.
8 Potato Baskets.
4 Iron Pails.
10 Wooden Pails.
20 Grain Bags.
1 Steelyard.
1 Beam Scales.
1 Fairbank's Platform Scales.
3 Wheelbarrows.
3 Grindstones.
1 Jackscrew.
4 Clay Picks.
4 Gravel Picks.
2 Iron Bars.

FARM TOOLS AND EQUIPMENTS—Concluded.

2 Steel Bars.
2 Cant Dogs.
1 Queen of Harvest Separator.
1 Patent Wain Jack.
2 Two-horse Hay Racks.
1 Two-horse Farm Wagon.
1 Two-horse Farm Jigger.
3 Two-horse Farm Carts.
1 One-horse Express Wagon.
1 One-horse Riding Wagon.
1 One-horse Pung.
1 Two-horse Tag Sled.
2 Two-horse Logging Sleds.
1 Two-horse Wood Sled.
1 One-horse Wood Sled.
2 Double Team Harnesses.
1 Single Team Harness.
1 Carriage Harness.
4 Sets Double Whiffletrees and Chains.
3 Crotch Chains.
4 Logging Chains.
2 Draft Chains.
1 Set Tag Chains for Logging.
10 Horse Blankets.
6 Head Halters.
5 Surcingles.
2 Spring Scales.
1 Pike Handspike.
3 Stone Hammers.
6 Chopping Axes.
2 Broad Axes.
3 Hand Axes.
4 Nail Hammers.
4 Jack Planes.
2 Jointing Planes.
1 Smoothing Plane.
4 Mortise Chisels.
5 Paring Chisels.
2 Bitstocks.
1 Set Auger Bits.
1 Extension Bit.
3 Handsaws.
1 Splitting Saw.
1 Fine Saw.
1 Pruning Saw.
1 Cross-cut Saw.
4 Wood Saws.
1 Meat Saw.
2 Carpenters' Squares.
1 Try Square.
1 Carpenter's Bevel.
1 Draw Shave.
1 Spoke Shave.
2 Saw Sets.
1 6-8 inch Gauge.
1 Eagle Pruning Tool.
1 Ralph's Oneida Cheese Vat.
1 Ralph's Cheese Press and Equipments.
1 Lactometer.
8 Milk Testing Tubes.

J. R. FARRINGTON, *Farm Superintendent.*

TREASURER'S REPORT.

To the Trustees of the State College of Agriculture and the Mechanic Arts:

GENTLEMEN:—I herewith present my annual report of the receipts and expenditures of the College for the past year:

GENERAL ACCOUNT.

1876.	RECEIPTS.	
Nov. 23,	For College note, dated Nov. 22, 1876, on 4 mos., (discount $61.)	$2,939 00
1877.		
Mar. 14,	Received last legislative appropriation	15,218 00
		18,157 00
1876.	EXPENDITURES.	
Nov. 20,	Balance due Treasurer per last annual report	1,515 76
Dec. 7,	Paid J. R. Farrington, for college debts	600 00
Dec. 19,	S. L. Boardman, expenses as Trustee	23 40
1877.		
Jan. 3,	D. Bugbee & Co., baskets	7 20
Jan. 22,	N. W. Bond, stove and fittings	10 10
Mar. 22,	College note dated Nov. 22, 1876	3,000 00
	Wm. P. Wingate, expenses as Trustee	74 90
	H. H. Thayer, plating knives	4 50
	C. A. Chaplin, expenses as Trustee	46 55
Mar. 23,	Lyndon Oak, expenses as Trustee	43 00
Mar. 24,	M. C. Fernald, periodicals	50 00
	Same, physical apparatus	350 00
Mar. 27,	J. R. Farrington, college debts	500 00
Mar. 30,	W. A. Pike, for department of engineering	450 00
	Same, for furniture and apparatus	181 32
Mar. 31,	S. F. Dike, expenses as Trustee	41 35
Apr. 6,	G. H. Hamlin, department of drawing	100 00
Apr. 14,	C. H. Fernald, department of natural history	350 00
	F. L. Hills, military instruction	50 00
Apr. 21,	A. B. Aubert, chemical apparatus	500 00
May 26,	J. R. Farrington, construction of farm house	500 00
June 13,	Same, farm purposes	500 00
June 19,	Same, " "	300 00
July 6,	F. L. Hills, improvement of grounds	29 25
July 12,	S. T. Hincks, expenses as Trustee	43 10
July 13,	J. R. Farrington, construction of farm house	300 00
July 23,	Same, " "	1,000 00
Aug. 10,	Same, " "	1,000 00
Sept. 11,	J. S. Kimball, insurance on house and barn	70 00
Sept. 22,	J. R. Farrington, construction of farm house	500 00
Oct. 13,	Same, " "	400 00
Oct. 23,	Same, farm purposes	400 00
Oct. 27,	S. S. Low, moving stable	125 00
Nov. 16,	J. R. Farrington, farm house	500 00
		$13,565 43

CONGRESSIONAL ENDOWMENT FUND.

1876.	RECEIPTS.	
Dec. 4,	Received interest on State of Maine bonds	$2,145 00
1877.		
Jan. 3,	Received interest on Bangor city bonds ($6,000—6 mos.)	180 00
Jan. 6,	dividend St. P. & S. C. R. R., preferred stock	107 22
Feb. 23,	interest on State of Maine bonds	990 00
April 7,	dividend St. P. & S. C. R. R. preferred stock	108 29
May 10,	interest on State of Maine bonds	417 00
June 1,	" State of Maine bonds	2,145 00
July 2,	" Bangor bonds	180 00
July 6,	dividend St. P. & S. C. R. R. preferred stock	109 37
Aug. 18,	interest on State bonds	990 00
Oct. 5,	dividend St. P. & S. C. R. R preferred stock	110 46
Oct. 8,	interest on State bonds	417 00
		7,899 34
1876.	EXPENDITURES.	
Nov. 29,	Paid W. A. Pike, 3 months' salary	450 00
Nov. 30,	C. H. Fernald, 3 months' salary	375 00
Dec. 1,	M. C. Fernald, " "	450 00
	G. H. Hamlin, " "	250 00
	C. F. Allen, " "	500 00
	W. S. Chaplin, " "	375 00
	W. S. Chaplin, balance due to January 1, 1877	125 00
1877.		
Jan. 20,	J. R. Farrington, 3 months' salary	225 00
Feb. 6,	W. C. Fuller, " "	100 00
Mar. 2,	W. A. Pike, " "	450 00
	C. F. Allen, " "	500 00
	M. C. Fernald, " "	450 00
	C. H. Fernald, " "	375 00
	A. B. Aubert, " "	375 00
	G. H. Hamlin, " "	250 00
Mar. 7,	F. L. Hills, from February 1 to March 1, 1877	94 52
Mar. 13,	G. H. Hamlin, balance due on increase March 1, 1877	30 14
April 14,	J. R. Farrington, 3 months' salary	225 00
May 19,	W. C. Fuller, " " to 7th inst	100 00
May 31,	W. A. Pike, " "	450 00
June 2,	A. B. Aubert. " "	375 00
	F. L. Hills, " "	375 00
	C. H. Fernald, " "	375 00
	M. C. Fernald, " "	450 00
	G. H. Hamlin, " "	375 00
June 12,	C. F. Allen, " "	500 00
July 13,	J. R. Farrington, " "	225 00
Aug. 10,	W. C. Fuller, " "	100 00
Sept. 5,	W. A. Pike, " "	450 00
	F. L. Hills, " "	375 00
Sept. 6,	G. H. Hamlin, " "	375 00
Sept. 7,	C. H. Fernald, " "	375 00
	M. C. Fernald, " "	450 00
Sept. 8,	A. B. Aubert, " "	375 00
Sept. 15,	C. F. Allen, " "	500 00
	Miss I. S. Allen, teaching German	100 00
Oct. 13,	J. R. Farrington, 3 months' salary	225 00
Nov. 8,	W. C. Fuller, " "	100 00
		$12,249 66

SUMMARY.

RECEIPTS.		
GENERAL ACCOUNT.		
Proceeds of note discounted	$2,939 00	
Legislative appropriation	15,218 00	
		$18,157 00
ENDOWMENT FUND.		
Interest on State bonds	7,104 00	
Interest on Bangor bonds	360 00	
Dividend St. P. & S. C. R. R., preferred stock	435 34	
		7,899 34
		26,056 34
EXPENDITURES.		
GENERAL ACCOUNT.		
Balance due Treasurer on last annual report	1,515 76	
Note of College	3,000 00	
Construction of farm house	4,200 00	
Apparatus and furniture	1,948 62	
Farm purposes	1,200 00	
College bills (to J. R. Farrington)	1,100 00	
Improvement of grounds and repairs	158 75	
Expenses of Trustees	272 30	
Periodicals	50 00	
Military instruction	50 00	
Insurance	70 00	
ENDOWMENT FUND.		
Salaries	12,249 66	
Balance to new account	241 25	
		26,056 34

There will be due for salaries on the first proximo, $3,125, at which date there will also become due for interest on State bonds, $2,145.

The income from the college investments for the ensuing year may be estimated at $7.900.

Respectfully submitted.

ISAIAH STETSON, *Treasurer.*

November 20, 1877.

Having been directed by the Trustees to audit the foregoing account of the Treasurer, I have attended to that duty and report that I find said acccount properly vouched and correctly cast.

W. T. WINGATE.

November 22, 1877.

CATALOGUE

OF THE

OFFICERS AND STUDENTS

OF THE

Maine State College of Agriculture and the Mechanic Arts.

ORONO, MAINE, 1877-8.

FACULTY.

CHARLES F. ALLEN, D.D., President and Professor of English Literature and Moral Science.
MERRITT C. FERNALD, A. M., Professor of Mathematics and Physics.
ALFRED B. AUBERT, B. S., Professor of Chemistry.
WILLIAM A. PIKE, C. E., Professor of Civil and Mechanical Engineering.
CHARLES H. FERNALD, A. M., Professor of Natural History.
FRANCIS L. HILLS, Professor of Modern Languages and Military Instructor.
GEORGE H. HAMLIN, C. E., Professor of Drawing and Field Engineering.
JOSEPH R. FARRINGTON, Farm Superintendent.
HENRY LANDERS, Steward.
Prof. W. A. PIKE, Secretary.
Prof. G. H. HAMLIN, Librarian.

STUDENTS.

SENIOR CLASS.

Brown, Emma,	Orono.
Caldwell, Andrew James,	Cornwall, N. Y.
Chamberlain, Cecil Calvert,	Foxcroft.
Fernald, George Everett,	South Levant.
Heald, James,	Orono.
Howe, Richard Scrope,	Fryeburg.
Locke, John, Jr.,	Fryeburg.
Oaks, Frank Judson,	Oldtown.
Patterson, John Cameron,	Dexter.
Tripp, Winfield Eastman,	Lyman.
Walker, Edward Colby,	Fryeburg.
Webster, Otis Colby,	Augusta.

JUNIOR CLASS.

Bean, Harry Percy,	Bangor.
Blake, Edward Josiah,	North Bridgton.
Crosby, Simon Percy,	Dexter.
Curtis, John Andrew,	Bowdoin.
Cutter, John Dana,	Brewer.
Decker, Wilbur Fisk,	Bowdoinham.
Decrow, David Augustus,	Bangor.
Ferguson, Willis Edwin,	Bangor.
Gibbs, Charles Wingate,	Glenburn.
Goodale, Loomis Farrington,	Bangor.
Gould, Annie May,	Stillwater.
Holt, Nellie Maud,	Orono.
Johnson, Edward Clinton,	Gorham.
Kidder, Frank Eugene,	Bangor.
Libby, Mark D.,	Riverside.
Loring, Charles Sewall,	Phipsburg.
Merrill, Albert Young,	Orono.
Merrill, George Perkins,	Auburn.
Meserve, John William,	Rockland.
Moore, Arthur Lee,	Limerick.
Morse, Charles Adelbert,	Bangor.
Peaks, Henry Wilson,	Charleston.
Potter, Fred David,	Waldoboro'.
Smith, Eugene Gardiner,	Richmond.
Shaw, Alton Jhacellous,	Auburn.
Vinal, Percia Ann,	Orono.
Warren, George Otis,	Fryeburg,
Webster, Herbert,	Orono.

SOPHOMORE CLASS.

Allen, Charles Morse,	Orono.
Atwood, Edward Norton,	Cape Elizabeth.
Austin, Granville,	Fryeburg.
Bartlett, Monroe James,	Litchfield.
Brown, Albert Hinckley,	Oldtown.
Cheney, Charles Eastman,	Scarboro'.
Cleaveland, Woodbury Fremont,	Skowhegan.
Davis, Marcia,	Stillwater.
Elliot, Fred Burton,	Bowdoin.
Farrington, Sarah Perkins,	Orono.
Fernald, Charles Wilbur,	South Levant.
Fickett, Fred Wilden,	Etna.
Fuller, Osgood Everett,	Camden.
Goodwin, Harry Herrick,	Biddeford.
Jones, Daniel Sherman,	Dennysville.
Kyes, Prescott, Jr.,	Richmond.

SOPHOMORE CLASS—CONCLUDED.

Lufkin, George William,	North Yarmouth.
Mansfield, Frank Albert,	Camden.
Matthews, Annie A.,	Stillwater.
Murray, Henry Wilson,	Solon.
Nash, Charles William,	Addison.
Oak, Willis Laurens,	Garland.
Patten, Franklin Rand,	Hampden.
Pease, Charles Truman,	Bridgton.
Powers, Fred Wallace,	Fryeburg.
Purinton. James Frank,	Bowdoin.
Randall, Mortier Clement,	Stillwater.
Webster, Howard Elmer,	Orono.
Webster, Daniel, Jr.,	Bangor.
Wellington, Arthur Lee,	Fort Fairfield.

FRESHMAN CLASS.

Andrews, Henry Harris,	Montross, Va.
Brown, Henry William,	Orono.
Buck, Clara Louise,	Stillwater.
Chandler, Charles Peleg,	New Gloucester.
Chapin, Elmer Clarence,	Bangor.
Colburn, Fannie Eliza,	Orono.
Farrington, Edward Holyoke,	Orono.
Farrington, Oliver Cummings,	Orono.
Fogg, Charles Henry,	Biddeford.
Gee, Archy Stuart,	Orono.
Holmes, George William,	Norway.
Ingalls, Adam Theodore,	South Bridgton.
Libby, Clara Alice,	Orono.
Luques, Edward Childs,	Biddeford.
Macomber, Charles Sumner,	Milo.
Moor, Charles Lincoln,	Hartland.
Murray, Benjamin Franklin,	Solon.
Nichols, Charles Stuart Davis,	Saco.
Nowland, Martin,	Ashland.
Plaisted, Harold Mason,	Bangor.
Ring, Alice Isabel,	Orono.
Ring, May Lilian,	Orono.
Ross, Charles Champunet,	Orono.
Southard, Clara,	Orono.
Tidd, Charles Plummer,	Springfield.
Tidd, Harry Powell,	Springfield,
Tilden, William Reed,	Castine.
Vinal, William Albert, Jr.,	Orono.
Wales, William Gorton,	Hampden.
Weeks, Frank Benjamin,	Orono.

Welch, Flora,	Orono.
Wilson, George Henry,	Orono.
Wilson, John Barrows,	Orono.
Wyman, Levi Augustus,	Ellsworth.

SPECIAL COURSE.

Atwood, Horace Wood,	Northbridge, Mass.
Benjamin, Charles H.,	Patten.
Carver, Benjamin Vanness,	Carver's Harbor.
Elwell, Charles C.,	Patten.
Fessenden, Frank Pierce,	South Bridgton.
Horne, John Francois,	Norway.
Horton, John Bancroft, Jr.,	Calais.
Ramsdell, Emily Isabel,	Atkinson.
Simpson, Charles Sumner,	North Turner.
Spofford, John C.,	Webster.

RESIDENT GRADUATES.

Farrington, Arthur Manley,	Orono.
Jordan, Whitman Henry,	New Gloucester.
Haskell, Newall Prince,	New Gloucester.
Blackinton, Alvah DeOrville,	Rockland.

SUMMARY.

Seniors,	12	Special,	10
Juniors,	28	Resident Graduates,	4
Sophomores,	30		—
Freshmen,	34	Total,	118

OFFICERS OF THE COBURN CADETS.

MAJOR—Prof. F. L. Hills.
ADJUTANT—C. C. Elwell.
QUARTERMASTER—J. C. Patterson.

COMPANY A.

Captain, C. C. Chamberlain.
Senior 1st Lieut., J. Locke, Jr.
Junior 1st Lieut., J. C. Patterson.
Junior 2d Lieut., F. J. Oakes.
1st Sergeant, E. J. Blake.
2d Sergeant, J. W. Meserve.
3d Sergeant, F. D. Potter.
4th Sergeant, M. D. Libby.
1st Corporal, G. W. Lufkin.
2d Corporal, C. M. Allen.
3d Corporal, F. W. Fickett.
4th Corporal, C. W. Nash.

COMPANY B.

Captain, A. J. Caldwell.
Senior 1st Lieut., C. C. Elwell.
Junior 1st Lieut., G. E. Fernald.
Junior 2d Lieut., O. C. Webster.
1st Sergeant, W. F. Decker.
2d Sergeant, H. Webster.
3d Sergeant, J. D. Cutter.
4th Sargeant, A. Y. Merrill.
1st Corporal, F. W. Powers.
2d Corporal, P. Keyes, Jr.
3d Corporal, B. V. Carver.
4th Corporal, O. E. Fuller.

PRIZES FOR 1877.

Coburn Prize for best Sophomore Declamation, awarded to A. Y. Merrill and H. W. Peaks.

Coburn Prize for best Junior Essay, awarded to Miss Emma Brown.

Prize for best Essay before the Board of Agriculture, awarded to C. C. Chamberlain.

DESIGN OF THE INSTITUTION.

It is the design of the Maine State College of Agriculture and the Mechanic Arts, to give the young men of the State who may desire it, at a moderate cost, the advantages of a thorough, liberal and practical education. It proposes to do this by means of the most approved methods of instruction, by giving to every young man who pursues the course of study an opportunity practically to apply the lesson he learns in the class-room, and by furnishing him facilities of defraying a part of his expenses by his own labor.

By the act of Congress granting public lands for the endowment and maintenance of such colleges, it is provided that the leading object of such an institution 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."

While the courses of study fully meet this requisition, and are especially adapted to prepare the student for agriculture and mechanical pursuits, it is designed that they shall be also sufficiently comprehensive, and of such a character, as to secure to the student the discipline of mind and practical experience necessary for entering upon other callings or professions.

CONDITIONS OF ADMISSION.

Candidates for admission to the Freshman class must be not less than fifteen years of age, and must pass a satisfactory examination in Arithmetic, Geography, English Grammar, (especial attention should be given to Orthography, Punctuation and Capitals) History of the United States, Algebra as far as Quadratic Equations, and five books in Geometry.

Although the knowledge of Latin is not required as a condition of admission, yet the study of that language is earnestly recommended to all who intend to enter this institution.

Candidates for advanced standing must sustain a satisfactory examination in the preparatory branches, and in all the studies previously pursued by the class they propose to enter.

Satisfactory testimonials of good moral character and industrious habits will be rigidly exacted.

The day after commencement, which is the last Wednesday of June, and the day before the beginning of the first term, are the appointed times for the examination of candidates.

COURSE OF INSTRUCTION.

Five full courses are provided, viz: A course in Agriculture; in Civil Engineering; in Mechanical Engineering; in Chemistry; and in Science and Literature. The studies of the several courses are essentially common for the first two years.

In the course of Science and Literature those studies marked with a star are to be taken in place of those that immediately precede them in the Agricultural course.

There will be regular exercises during the four years in English Composition, Declamation and Military Tactics. Lectures will be given to the Freshmen class, on Physics, Meteorology, Physical Geography and Botany; to the Sophomore class, on Chemistry, Horticulture and Practical Agriculture; to the Junior class, on Anatomy, Physiology, Astronomy and English Literature; and to the Senior class, on Rural Law, Mineralogy, Geology, Stock Breeding, Cultivation of Grasses and Cereals.

SPECIAL COURSE.

Students may be received for less time than a full course, and may select from the studies of any class such branches as they are qualified to pursue successfully. Students in the Special Course are not entitled to a degree, but certificates of proficiency may be given them.

DEGREES.

The full course in Civil Engineering entitles to the Degree of Bachelor of Civil Engineering; the full course in Mechanical Engineering, to the Degree of Bachelor of Mechanical Engineering; the full course in Agriculture, Chemistry, or Science and Literature, to the Degree of Bachelor of Science.

Three years after graduation, on presentation of a thesis with the necessary drawings, and proof of professional work or study, the Bachelors of Civil Engineering may receive the Degree of Civil Engineer; the Bachelors of Mechanical Engineering, the Degree of Mechanical Engineer; the Bachelors of Science, the Degree of Master of Science.

COURSES OF STUDY.

FIRST YEAR.

FIRST TERM. Physical Geography, Meteorology, Algebra, Rhetoric. P. M. Labor on Farm.

SECOND TERM. French, Algebra and Geometry, Farm Drainage and Botany. P. M. Book-Keeping and Labor.

SECOND YEAR.

FIRST TERM. French and Farm Implements, General Chemistry, Trigonometry. P. M. Free Hand Drawing and Chemistry.

SECOND TERM. Mechanical Cultivation of the Soil, and Surveying, or (L) History of England, English Literature and Physics. Analytical Geometry and Calculus or Qualitative Chemistry. P. M. Mechanical Drawing and Field Work.

THIRD YEAR.

COURSE IN AGRICULTURE—FIRST TERM. Physics, Physiology, Human Anatomy and Hygiene, German, Agricultural Chemistry or *English Literature. P. M. Chemistray or *Analysis of English Authors.

SECOND TERM. Zoology and Entomology, German, Astronomy and Mechanics. P. M. Chemistry and Experimental Farming, or *Analysis of American Authors.

COURSE IN CIVIL ENGINEERING—FIRST TERM. Calculus, Hinck's Field Book, Pysics, German. P. M. Field Work and Shading.

SECOND TERM. Astronomy, Descriptive Geometry, First Part of Rankine's Civil Engineering and Mechanics, German. P. M. Isometric and Cabinet Projections and Perspective.

COURSE IN MECHANICAL ENGINEERING—FIRST TERM. Calculus, Machinery and Mill Work, Physics, German. P. M. Machine Drawing and Shading.

SECOND TERM. Astronomy, Descriptive Geometry, Machinery and Mill Work, German. P. M. Machine Drawing and Designing.

COURSE IN CHEMISTRY—FIRST TERM. Physics, Physiology, German, Chemistry. P. M. Laboratory Work.

SECOND TERM. Zoology and Entomology, German, Chemistry. P. M. Laboratory Work.

FOURTH YEAR.

COURSE IN AGRICULTURE—FIRST TERM. Comparative Anatomy, History of Civilization, Dairy Farming and Stock Breeding, *Logic. P. M. Experimental Farming and Agricultural Botany, *Historical Readings and Analysis.

SECOND TERM. U. S. Constitution and Political Economy, Mineralogy and Geology, Cultivation of Cereals, Landscape Gardening, Rural Architecture and Sheep Husbandry, *Mental and Moral Science.

COURSE IN CIVIL ENGINEERING—FIRST TERM. Second Part of Rankine's Civil Engineering, Logic, Physiology. P. M. Stereotomy, Topography and R. R. Work.

SECOND TERM. U. S. Constitution and Political Economy, Mineralogy and Geology, Third Part of Rankine's Civil Engineering. P. M. Machine Drawing and Designing.

COURSE IN MECHANICAL ENGINEERING—FIRST TERM. Steam Engine, Logic, Pysiology. P. M. Applied Descriptive Geometry and Machine Drawing.

SECOND TERM. Steam Engine Designs and Specifications, U. S. Constitution and Political Economy, Mineralogy and Geology. P. M. Machine Drawing and Designing.

COURSE IN CHEMISTRY—FIRST TERM. Comparative Anatomy, History of Civiliation, Logic. P. M. Chemistry.

SECOND TERM. U. S. Constitution and Political Economy, Mineralogy and Geology, Chemistry. P. M. Laboratory Work.

SPECIAL FEATURES OF THE COURSES.

The prominence given to the Natural Sciences, and the practical element associated with the studies, render the first two years exceedingly valuable, as the groundwork of whatever more specific department may be pursued. Those who complete the course in Agriculture will have attained a good knowledge of Mathematics, French, German and English Literature, besides the studies in Natural Science that have a direct bearing upon agriculture. The study of Botany extends through nearly a year, commencing early in the Spring and extending late in the Autumn. General Chemistry and Physics continue through a whole year. Under Agricultural Chemistry will be considered composition of soils, relations of air and moisture to vegetable growth, chemistry of farm processes, methods of improving soils, fertilizers, and other topics which properly come under this department.

This course, slightly modified so as better to adapt it to those wishing a thorough practical education for other employments, is called the course in Science and Literature. This includes mental and moral science, logic and more of general literature. The student in Civil Engineering having laid a good foundation of general culture in literary studies, modern languages, mathematics and natural science, in his Junior year enters upon his engineering studies, embracing the theory and practice of constructing roads, railroads, bridges, canals, dams and other structures, and has thorough instruction and practice in mechanical and topographical drawing. The afternoons are devoted to field work and drawing.

With the same instruction in general studies, those who take the course in Mechanical Engineering study the elements of mechanism, machinery and mill work, steam engines, water wheels, estimates and specifications for machinery. They are instructed to draw working plans from descriptions, models and inspection of machinery, as well as to design machines.

The course in Chemistry includes general, analytical and agricultural chemistry. Under analytical chemistry is comprised the qualitative and quantitative analysis of minerals, alloys, earths, fertilizers and farm products. The students devote three hours a day to laboratory practice.

LABOR.

It is a peculiarity of the college, that it makes provision for labor, thus combining practice with theory, maunal labor with scientific culture. Students in this institution are required to labor a certain portion of each day, not exceeding three hours, for five days in the week.

The labor is designed to be as much as possible educational, so that every student may become familiar with all the forms of labor upon the farm and in the gardens. In the lower class the students are required to work on the farm, and they receive compensation for their labor according to their industry, faithfulness and efficiency, the educational character of the labor being also taken into account. The maximum amount paid will be thirty cents for three hours labor.

MILITARY.

Thorough instruction is given in Military Science by a competent officer. The instruction extends through the whole college course, and embraces personal, squad, company and battalion drill. The students are enrolled in companies under ther own officers. Arms are furnished by the State. The uniform is navy blue yacht cloth, sack coat and pants, without brass buttons or trimmings that attract attention.

LOCATION.

The college has a pleasant and healthful location, between the villages of Orono and Upper Stillwater, and about a mile from each. Stillwater river, a tributary of the Penobscot, flows in front of the buildings forming the western boundary of the college farm, and adding much to the beauty of the surrounding scenery.

The European & North American Railway, over which trains pass several times each day, has a station at the village of Orono. The college is within nine miles of the city of Bangor, and is consequently easily accessible from all parts of the State.

FARM AND BUILDINGS.

The college farm contains three hundred and seventy acres of land of high natural productiveness, and of great diversity of soil, and is therefore well adapted to the experimental purposes of the institution.

White Hall, the building first erected, affords excellent accommodations for limited number of students. The lower rooms of this building are appropriated to general and class purposes.

Brick Hall contains forty-eight rooms. The boarding house connected with the college buildings is open to students. With these buildings, the institution furnishes desirable accommodations for one hundred and twenty-five students.

The chemical laboratory contains two apparatus rooms, a lecture room, a cabinet, a library and weighing room, a recitation room, and rooms for analytical and other purposes, and is in all respects admirably adapted to the wants of the chemical and mineralogical departments.

APPARATUS.

The college is furnished with new and valuable apparatus for the departments of Physical Geography, Natural Philosophy and Chemistry, and for surveying and civil engineering, to which additions will be made as the exigencies of the several departments require. Models have been obtained from the United States Patent Office, and others have been purchased, that serve for purposes of instruction.

LIBRARY.

The library already contains 3,648 volumes, some of which have been obtained by purchase, while others have been kindly given to the college. The volumes secured through the liberality of Governor Coburn, and the

gifts of other friends, are a valuable addition to this department. It is earnestly hoped that so important an auxiliary in the education of students in the college will not be disregarded by the people of the State, but that liberal contributions will be made to the library, not only of agricultural and scientific works, but also those of interest to the general reader.

READING ROOM.

The reading room is supplied with a number of valuable newspapers and periodicals. Grateful acknowledgment is herewith made for the following named papers, generously sent by the proprietors to the college:

Aroostook Times, Agricultural Gazette, Androscoggin Herald, American Sentinel, Bangor Weekly Courier, Camden Journal, Christian Mirror, Christian Register, Dexter Gazette, Dirigo Rural, Eastern Argus, Kennebec Journal, Lincoln County News, Maine Farmer, Maine Standard, New England Farmer, N. Y. Observer, Northern Border, North Star, Official Gazette U. S. Patent Office, Oxford Register, Patten Tribune, Piscataquis Observer, Somerset Reporter, Sunrise, York County Independent.

The following are furnished by subscription:

American Agriculturist, American Chemist, American Naturalist, American Journal of Science and Art, Appleton's Journal, Atlantic Monthly, Bangor Daily Whig and Courier, Bangor Daily Commercial, Boston Journal of Chemistry, Boston Daily Globe, Boston Statesman, Evening Post, Engineering Magazine, Entomologist, Galaxy, Gardener's Chronicle, Harper's Monthly, Harper's Weekly, International Review, Journal Royal Agricultural Society, England, Journal Franklin Institute, Leslie's Illustrated News, London Times, New York Tribune, New York World, Popular Science Monthly, Scribner's Monthly, Springfield Republican, Technologist, Toledo Blade.

CABINET.

Rooms have been fitted up with cases of minerals, and specimens of natural history, and several hundred specimens have been presented to the college. The valuable private cabinet of Prof. C. H. Fernald is placed in these rooms, and is accessible to the students. All specimens presented will be properly credited and placed on exhibition. Rocks illustrating the different geological formations, and minerals found within the State, are particularly solicited. Additions have been made during the past year.

LITERARY SOCIETIES.

Flourishing societies have been organized by the students of the college, which hold weekly meetings for declamations, discussions, and other literary exercises.

PUBLIC WORSHIP.

All students are required to attend daily prayers at the college, and public worship on the Sabbath at some one of the neighboring churches, unless excused by the President.

EXPENSES.

Tuition is free to students residing within the State. Those from other States will be charged twelve dollars per term. Rooms are free. All bedding and furniture must be supplied by the students, who will also furnish their own lights. Board, washing, and fuel will be furnished at cost. The price of board is two dollars and sixty cents per week; washing sixty cents per dozen. These bills, with those for incidental expenses, are payable at or before the close of each term.

The terms are so arranged that the long vacation occurs in the winter, that students may have an opportunity to teach during that time. By means of the amount thus earned, together with the allowance for labor, the industrious and economical student can cancel the greater part of his college expenses.

GRADUATES.

CLASS OF 1872.

Benjamin F. Gould, C. E.,	San Juan, California.
George E. Hammond, C. E.,	Elliot.
Heddle Hilliard, C. E.,	Grand Southern R. R., N. B.
Edwin J. Haskell, B. S.,	Saccarappa, Haskell Silk Company.
Eber D. Thomas, B. S.,	Grand Rapids, Mich.
George O. Weston, B. S.,	Farmer, Norridgewock.

CLASS OF 1873.

Russell W. Eaton, C. E.,	Providence, R. I., D. M. Thompson & Co.
George H. Hamlin, C. E.,	Orono, Maine State College.
Fred W. Holt, C. E.,	Phœnixville Bridge Company, Penn.
Charles E. Reed, C. E,,	Free Press, Detroit, Mich.
John M. Oak, B. S.,	Merchant, Garland.
Frank Lamson Scribner, B. S.,	Girard College, Philadelphia.
Harvey B. Thayer, B. S.,	Garland.

CLASS OF 1874.

William A. Allen, C. E.,	Portland, M. C. R. R.
Walter Balentine, B. S.,	Wesleyan University, Conn.
William H. Gerrish, B. S.,	Portland.
John I. Gurney, B. S.,	Dorchester, Mass.
David R. Hunter, B. S.,	Farmer, Clinton.
Louise H. Ramsdell, B. S.,	Teacher, Atkinson.

CLASS OF 1875.

Solomon W. Bates, C. E.,	Boston, Mass.
Wilbur A. Bumps, C. E.,	Dexter High School.
Samuel H. Clapp, C. E.,	Comptonville, California.
Lewis F. Coburn, C. E.,	Boothbay.
Charles F. Durham, C. E.,	California.
Edson F. Hitchings, C. E.,	Waterville.
Allen G. Mitchell, C. E.,	Somerset R. R.
George M. Shaw, C. E.,	Comptonville, California.
*Edgar A. Work, C. E.,	U. S. Military Academy, West Point.
Edward Stevens How, M. E.,	Portland.

*Deceased.

Edmund D. Mayo, M. E.,	Clear Water, Minn.
Albert E. Mitchell, M. E.,	Philadelphia, Penn.
Minott W. Sewall, M. E.,	Philadelphia, Penn.
Charles F. Colesworthy, B. S.,	California.
Alfred M. Goodale, B. S.,	Lewiston.
Whitman H. Jordan, B. S.,	Dennysville.
*Fred L. Moore, B. S.,	California.
Luther W. Rogers, B. S.,	Farmer, Stillwater.
Wesley Webb, B. S.,	Farmer, Unity.

CLASS OF 1876.

Abbott, Edmund, B. S.,	Winterport.
Allen, Charles Plummer, B. S.,	Bangor.
Beckler, Eldridge Harlow, B. C. E.,	Livermore Center.
Bisbee, Fred Milton, B. C. E.,	Livermore Center.
Blanding, Edward Mitchell, B, S.,	Bangor.
Brainard, Charles Marcellus, B. S.,	California.
Buker, George Haskell, B. S.,	Castine.
Cowan, Florence Helen, B. S.,	Orono.
Crosby, Oliver, B. M. E.,	St. Paul, Minn.
Cyr, Vetal, B. S.,	Fort Kent.
Dike, James Edward, B. C. E.	Sebago.
Dike, William Oliver, B. S.	Sebago.
Estabrooke, Horace Melvyn, B. S.,	Maysville.
Farrington, Arthur Manly, B. S.,	Orono.
Foss, George Obed, B. M. E.,	Dexter.
Haines, William Thomas, B. S.,	West Corinth.
Hamilton, Henry Fairfield, B. S.,	Saco.
Haskell, Newall Prince, B. S.,	New Gloucester.
Hubbard, Philip Wadsworth, B. S.,	Philadelphia, Pa.
Jones, Samuel Messer, B. M. E.,	Madison.
Lewis, Albert Augustus, B. S.,	Orono.
Long, Herbert Augustine, B. M. E.,	Machias.
Lothrop, Luther Ramsdell, B. C. E.,	Boston, Mass.
Martin, Nelson Hussey, B. S.,	Danforth.
Oak, Charles Edson, B. C. E.,	Garland.
Parks, George Daniel, B. C. E.,	Richmond.
Peirce, Hayward, B. S.,	Frankfort.
Reed, Frank Radford, B. C. E.,	Roxbury.
Reynolds, Henry Jones, B. S.,	Dennysville.
Rogers, Charles Wilson, B. C. E.,	Richmond.
Stevens, William Lewis, B. M. E.,	Redwing, Minn.
Williams, John Howard, B. S.,	Milo.

*Deceased.

CLASS OF 1877.

Blackinton, Alvah DeOrville, B. C. E.,	Rockland.
Burns, Robert Bruce, B. C. E.,	Fort Fairfield.
Danforth, Edward Franklin, B. S.,	Norridgewock.
Elkins, Augustus Jerome, B. M. E.,	Oldtown.
Emery, Alicia Town, B. S.,	Orono.
Gould, Samuel Wadsworth, B. S.,	Hiram.
Lunt, Joseph Cony, B. C. E.,	Benton.
Phillips, Fred Foster, B. S.,	Hermon.
Shaw, Samuel, B. M. E.,	Augusta.
Stone, Frank Pierce, B. S.,	Livermore Falls.
Stevens, Thomas Jefferson, B. M. E.,	Auburn.
Sturgis, George Eugene, B. C. E.,	Vassalboro'.
Towne, Charles Elmer, B. C. E.,	East Dover.
Weeks, James Walter, B. M. E.,	Castine.
Weeks, Nellie Estelle, B. S.,	Orono.
Webster, Ivan Eldorus, B. S.,	Orono.

CALENDAR.

1875—Feb. 12. Tuesday, Second Term commences.
June 20, 21. Thursday and Friday, Examinations.
" 22. Saturday, Prize Declamation by Sophomores.
" 23. Sunday, Baccalaureate Address.
" 24. Monday, Prize Essays by Juniors.
" 26. Wednesday, Commencement.
" 27. Thursday, Examination of Candidates for Admission.
Vacation of five weeks.
Aug. 6. Tuesday, Examination of Candidates for Admission.
" 7. Wednesday, Term commences.
Nov. 21, 22. Thursday and Friday, Examinations.
Vacation of eleven weeks.

SUMMARY—1869.

MONTHS.	THERMOMETER IN THE OPEN AIR.											RAIN AND SNOW.		CLOUDS.	WINDS.				BAROMETER.			FORCE OR PRESSURE OF VAPOR IN INCHES.			RELATIVE HUMIDITY OR FRACTION OF SATURATION.		
	Mean of hottest day.		Mean of coldest day.		Highest temperature.		Lowest temperature.		Mean of maximum temperature.	Mean of minimum temperature.	Mean of three daily observations.	Amount of rain or melted snow in guage—inches.	Depth of snow—inches.	Mean percentage of cloudiness.	PER CENT. OF DIRECTION.				BAROMETER HEIGHT REDUCED TO FREEZING POINT.								
	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.							N. W. and W.	S. W. and S.	S. E. and E.	N. E. and N.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.
		°		°		°		°	°	°	°																
January	5	37.5	22	-3.8	8	43.0	19	-16.0	25.44	10.74	18.37	2.542	10.75	.61	.46	.16	.03	.35	30.391	29.178	29.767	.293	.011	.092	100	26	78
February	13	37.4	2	7.7	13	44.0	25	-8.0	29.21	14.79	21.83	4.264	32.25	.58	.46	.25	.04	.25	30.254	28.858	29.706	.191	.020	.094	100	25	74
March	27	42.3	5	1.2	28	50.0	6	-22.0	32.62	12.51	22.99	3.356	10.42	.46	.54	.32	.07	.07	30.300	29.265	29.828	.236	.005	.099	100	29	67
April	21	48.1	4	25.8	28	60.5	5	18.5	46.78	33.33	39.51	2.392	1.75	.58	.51	.26	.09	.14	30.016	29.319	29.660	.377	.071	.179	100	27	73
May	26	67.6	4	37.8	25	80.3	1	30.0	58.72	41.55	51.33	2.950	.....	.63	.43	.25	.16	.16	30.030	29.088	29.630	.546	.112	.279	100	27	73
June	3	67.7	9	52.5	3	81.5	9	38.0	68.38	50.34	59.58	3.800	.....	.56	.41	.34	.23	.02	30.143	29.346	29.797	.574	.196	.405	100	35	80
July	11	74.2	1	57.5	11	87.2	2	45.0	76.07	56.69	66.66	1.620	.....	.46	.29	.53	.18	.00	30.137	29.291	29.735	.826	.286	.495	100	38	76
August	20	74.0	31	51.2	11	83.0	8	44.0	71.91	53.10	62.25	1.910	.....	.42	.48	.32	.08	.12	30.229	29.447	29.818	.730	.229	.406	100	34	72
September	8	69.5	28	41.7	5	80.5	29	35.0	68.86	50.67	59.55	3.670	.....	.55	.26	.39	.23	.12	30.243	29.316	29.979	.758	.154	.415	100	42	80
October	4	65.3	28	26.2	1	73.5	28	21.0	53.38	38.05	44.83	9.570	9.00	.54	.34	.29	.20	.17	30.167	29.176	29.746	.585	.095	.269	100	38	82
November	6	46.3	16	24.0	20	52.8	26	15.5	38.93	24.42	32.32	3.360	0.75	.62	.29	.28	.24	.19	30.174	28.883	29.740	.374	.057	.162	100	35	85
December	1	39.7	15	-0.2	1	53.0	9	-13.5	29.85	13.28	22.08	5.283	20.00	.55	39	.12	.11	.38	30.519	28.891	29.949	.375	.009	.109	100	28	77
	July		Jan'y		July		March																				
Year	11	74°.2	22	-3°.8	11	87°.2	6	-22°.0	50°.01	33°.37	41°.77	44.717	84.92	.55	.41	.29	.14	.16	30.519	28.858	29.780	.826	.005	.250	100	25	76

SUMMARY—1870.

MONTHS.	THERMOMETER IN THE OPEN AIR.											RAIN AND SNOW.		CLOUDS.	WINDS.				BAROMETER.			FORCE OR PRESSURE OF VAPOR IN INCHES.			RELATIVE HUMIDITY OR FRACTION OF SATURATION.		
	Mean of hottest day.		Mean of coldest day.		Highest temperature.		Lowest temperature.		Mean of maximum temperature.	Mean of minimum temperature.	Mean of three daily observations.	Amount of rain or melted snow in guage—inches.	Depth of snow—inches.	Mean percentage of cloudiness.	PER CENT. OF DIRECTION.				BAROMETER HEIGHT REDUCED TO FREEZING POINT.								
	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.							N. W. and W.	S. W. and S.	S. E. and E.	N. E. and N.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.
		°		°		°		°	°	°	°																
January	23	40.6	14	−9.7	23	44.2	14	−14.2	30.92	13.05	22.35	5.615	26.00	.57	38	.26	.12	.14	30.578	29.249	29.913	.284	.020	.108	100	26	80
February	15	39.6	4	−6.6	19	47.0	4	−17.0	26.59	8.36	18.22	4.296	15.00	.57	.43	.12	.21	.24	30.409	28.902	29.692	.323	.016	.093	100	47	80
March	30	42.2	11	6.2	30	52.5	12	−5.8	35.01	21.09	27.90	2.114	10.50	.47	.44	.04	.08	.44	30.343	29.190	29.761	.227	.020	.104	100	18	65
April	28	57.4	4	34.3	28	70.0	16	25.5	52.78	34.61	43.51	3.553	2.00	.57	.18	.24	.19	.39	30.402	29.390	29.850	.443	.068	.206	100	13	73
May	29	65.0	9	39.8	29	81.0	5	31.0	62.26	41.48	51.87	1.960	.....	.44	.31	.40	.10	.19	30.211	29.347	29.791	.604	.102	.264	100	20	68
June	25	74.7	9	56.7	25	89.5	10	51.0	75.34	57.24	65.74	2.070	.....	.53	.19	.58	.13	.10	30.023	29.455	29.813	.703	.253	.479	100	30	76
July	24	82.2	1	58.5	24	94.0	2	48.0	79.03	58.35	68.88	1.780	.....	.40	.26	.58	.10	.06	29.980	29.543	29.758	.878	.228	.499	97	28	71
August	10	77.8	27	54.6	9	88.0	27	39.8	77.52	55.60	66.69	3.210	.....	.41	.34	.42	.13	.11	30.136	29.488	29.805	.805	.217	.470	100	31	72
September	4	68.4	12	48.3	4	78.0	13	35.0	67.26	47.64	57.76	2.230	.....	.37	.41	.34	.03	.22	30.273	29.392	29.928	.725	.170	.363	100	29	70
October	12	60.1	27	31.0	2	70.0	27	21.0	56.24	38.91	47.25	5.530	1.50	.50	.30	.55	.05	.10	30.414	29.116	29.840	.527	.096	.271	100	31	79
November	3	52.0	30	23.6	3	56.8	30	21.0	42.80	30.61	36.58	5.608	5.50	.55	.47	.28	.07	.18	30.240	29.194	29.702	.436	.068	.173	100	38	77
December	2	36.9	24	3.4	2	44.0	24	−8.3	30.54	18.50	24.43	3.010	18.25	.61	.47	.17	.02	.34	30.320	29.175	29.645	.226	.028	.114	100	42	80
	July		Jan'y		July		Feb'y																				
Year	24	82°.2	14	−9°.7	24	94°.0	4	−17°.0	53°.02	35°.45	44°.26	40.976	78.75	.50	.35	.33	.10	.22	30.587	28.902	29.791	.878	.016	.279	100	13	74

SUMMARY—1871.

MONTHS.	THERMOMETER IN THE OPEN AIR.											RAIN AND SNOW.		CLOUDS.	WINDS.				BAROMETER.			FORCE OR PRESSURE OF VAPOR IN INCHES.			RELATIVE HUMIDITY OR FRACTION OF SATURATION.		
	Mean of hottest day.		Mean of coldest day.		Highest temperature.		Lowest temperature.		Mean of maximum temperature.	Mean of minimum temperature.	Mean of three daily observations.	Amount of rain or melted snow in guage—inches.	Depth of snow—inches.	Mean percentage of cloudiness.	PER CENT. OF DIRECTION.				BAROMETER HEIGHT REDUCED TO FREEZING POINT.								
	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.							N. W. and W.	S. W. and S.	S. E. and E.	N. E. and N.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.
		°		°		°		°	°	°	°																
January	16	37.6	23	-14.9	16	42.0	23	-20.6	21.74	5.08	13.34	2.597	13.50	.57	.47	.16	.05	.32	30.585	29.263	29.988	.236	.006	.084	100	17	80
February	25	42.1	5	-6.8	25	47.2	5	-16.7	30.42	10.99	19.90	2.532	14.00	.43	.55	.27	.11	.07	30.348	29.025	29.766	.234	.013	.092	100	38	72
March	12	51.4	24	24.8	12	58.7	29	17.0	41.02	28.35	34.65	4.108	8.00	.59	.39	.37	.07	.17	30.282	29.128	29.788	.354	.053	.159	100	27	76
April	21	52.7	6	30.9	21	66.5	1	22.6	48.02	33.97	40.85	4.010	1.00	.65	.35	.21	.12	.32	30.193	29.269	29.704	.335	.052	.187	100	34	73
May	30	76.0	5	36.3	30	88.6	5	33.0	59.73	41.43	50.65	3.480	1.50	.48	.47	.43	.03	.09	30.167	29.136	29.763	.545	.089	.240	100	17	63
June	3	75.4	16	52.9	3	87.8	16	44.0	72.01	51.82	61.99	2.580	.....	.45	.45	.51	.02	.02	29.990	29.302	29.708	.638	.203	.396	100	31	72
July	14	72.8	17	59.3	13	85.0	1	47.0	77.48	57.78	67.05	2.130	.....	.46	.27	.49	.14	.10	30.111	29.392	29.771	.671	.272	.482	100	31	75
August	4	73.9	20	58.2	4	85.0	22	42.0	75.85	56.08	65.83	3.850	.....	.37	39	.41	.14	.06	30.247	29.420	29.788	.956	.244	.471	100	35	74
September	3	69.5	30	44.8	3	80.0	15	28.8	64.11	44.53	54.70	1.100	.....	.35	.41	.30	.14	.15	30.270	29.453	29.885	.644	.095	.326	100	20	76
October	11	62.8	19	34.4	10	72.5	21	25.3	55.95	38.84	47.68	7.500	.....	.56	.29	.40	.20	.11	30.362	29.404	29.858	.644	.107	.272	100	39	76
November	1	43.0	30	3.4	1	53.0	30	0.0	34.53	22.95	29.00	3.580	15.00	.48	.58	.07	.10	.25	30.299	29.150	29.728	.403	.031	.132	100	44	78
December	4	40.4	21	9.8	25	47.5	22	-11.5	24.87	8.16	17.43	4.163	27.50	.59	.40	.33	.07	.20	30.534	29.000	29.794	.277	.024	.090	100	42	84
	May		Jan'y		May		Jan'y																				
Year	30	76°.0	23	-14°.9	30	88°.6	23	-20°.6	50°.44	33°.33	41°.92	41.630	80.50	.50	.42	.33	.10	.15	30.585	29.000	29.795	.956	.006	.244	100	17	75

SUMMARY—1872.

MONTHS.	THERMOMETER IN THE OPEN AIR.											RAIN AND SNOW.		CLOUDS.	WINDS.				BAROMETER.			FORCE OR PRESSURE OF VAPOR IN INCHES.			RELATIVE HUMIDITY OR FRACTION OF SATURATION.		
	Mean of hottest day.		Mean of coldest day.		Highest temperature.		Lowest temperature.		Mean of maximum temperature.	Mean of minimum temperature.	Mean of three daily observations.	Amount of rain or melted snow in guage—inches.	Depth of snow—inches.	Mean percentage of cloudiness.	PER CENT. OF DIRECTION.				BAROMETER HEIGHT REDUCED TO FREEZING POINT.								
	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.							N. W. and W.	S. W. and S.	S. E. and E.	N. E. and N.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.
		°		°		°		°	°	°	°																
January	13	32.8	7	−2.4	23	38.2	7	−9.2	24.99	9.54	17.45	2.182	16.00	.54	.48	.23	.05	.24	30.446	29.264	29.712	.201	.028	.087	100	49	82
February	25	31.6	23	2.2	21	40.0	3	−9.8	28.99	7.13	17.89	1.703	13.50	.39	.53	.15	.09	.23	30.382	29.140	29.708	.226	.025	.082	100	28	76
March	27	33.5	6	8.0	26	44.0	7	−16.5	29.01	10.00	19.30	5.234	38.00	.51	.52	.13	.05	.30	30.202	28.988	29.702	.191	.025	.086	100	32	76
April	30	49.2	1	27.4	20	63.0	7	20.0	48.72	31.49	40.26	1.928	3.00	.49	.48	.31	.05	.16	30.200	29.219	29.731	.302	.070	.162	100	25	66
May	27	60.2	5	41.5	19	71.8	11	34.0	60.08	44.10	52.13	3.920	.....	.67	.19	.32	.12	.37	30.162	29.244	29.745	.416	.098	.280	100	23	73
June	30	78.5	2	49.0	30	90.6	4	37.3	73.28	56.22	64.30	4.470	.....	.55	.27	.34	.19	.20	30.040	29.449	29.772	.750	.210	.459	100	36	77
July	16	79.5	27	61.1	16	90.0	26	49.0	78.54	59.19	68.69	2.680	.....	.47	.34	.42	.13	.11	30.047	29.531	29.736	.793	.256	.517	100	33	74
August	9	76.8	30	54.3	9	90.3	29	45.2	76.32	59.46	67.63	6.230	.....	.45	.30	.36	.18	.16	30.075	29.277	29.823	.750	.236	.530	100	28	79
September	8	72.2	3	52.5	8	84.3	5	41.4	66.16	51.38	58.70	3.550	.....	.56	.27	.30	.27	.16	30.172	29.409	29.829	.688	.234	.403	100	39	81
October	7	60.5	28	33.3	7	66.0	29	23.0	53.78	37.39	45.75	6.010	.....	.47	.23	.34	.12	.31	30.423	29.279	29.838	.500	.108	.254	100	36	80
November	12	44.6	30	20.4	12	47.0	21	12.4	39.35	28.18	33.77	7.055	10.00	.64	29	.25	.20	.26	30.252	28.712	29.770	.323	.068	.163	100	41	83
December	3	34.5	25	−11.8	6	38.4	25	−23.0	21.07	4.52	13.39	3.615	32.50	.59	.55	.23	.11	.11	30.363	29.056	29.822	.196	.011	.077	100	44	78
	July		Dec.		June		Dec.																				
Year	16	79°.5	25	−11°.8	30	90°.6	25	−23°.0	50°.02	33°.22	41°.60	48.577	113.00	.53	.37	.28	.13	.22	30.446	28.712	29.766	.793	.011	.258	100	23	77

SUMMARY—1873.

MONTHS.	THERMOMETER IN THE OPEN AIR.											RAIN AND SNOW.		CLOUDS.	WINDS.				BAROMETER.			FORCE OR PRESSURE OF VAPOR IN INCHES.			RELATIVE HUMIDITY OR FRACTION OF SATURATION.		
	Mean of hottest day.		Mean of coldest day.		Highest temperature.		Lowest temperature.		Mean of maximum temperature.	Mean of minimum temperature.	Mean of three daily observations.	Amount of rain or melted snow in guage—inches.	Depth of snow—inches.	Mean percentage of cloudiness.	PER CENT. OF DIRECTION.				BAROMETER HEIGHT REDUCED TO FREEZING POINT.								
	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.							N. W. and W.	S. W. and S.	S. E. and E.	N. E. and N.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.
		°		°		°		°	°	°	°																
January	17	37.8	30	-4.9	17	43.1	30	-26.5	23.52	4.75	15.01	4.090	22.00	.56	.38	.21	.09	.32	30.680	29.148	29.882	.275	.009	.086	100	44	83
February	28	31.4	2	2.7	7	39.5	2	-14.0	24.84	5.69	16.23	2.965	28.00	.48	.47	.20	.04	29	30.290	28.960	29.690	.174	.020	.079	100	41	76
March	30	38.3	24	12.6	29	46.2	5	-5.6	34.21	19.19	27.22	4.700	31.00	.54	.36	.29	.14	.21	30.311	28.838	29.682	.288	.028	.118	100	27	76
April	30	46.6	19	34.2	30	61.6	17	26.0	46.22	32.82	39.58	2.590	5.00	.58	.42	.10	.20	.28	30.060	29.205	29.717	.230	.088	.164	100	24	68
May	28	68.2	14	42.8	28	81.2	7	31.5	62.03	41.89	52.03	1.960	.....	.43	.41	.38	.04	.17	30.084	29.291	29.802	.663	.088	.245	97	20	62
June	26	72.7	4	47.1	26	86.5	3	36.0	71.57	48.78	60.74	1.320	.....	.40	.35	.32	.15	.18	30.142	29.296	29.770	.673	.115	.356	100	22	68
July	30	75.5	18	62.1	26	92.0	7	47.0	78.80	58.60	68.45	3.260	.....	.47	.34	.50	.11	.05	30.110	29.492	29.801	.748	.191	.497	100	26	71
August	3	73.4	24	55.3	3	88.0	28	35.0	74.50	52.95	63.65	1.810	.....	.41	.30	.33	.08	.29	30.141	29.621	29.878	.778	.197	.420	99	23	72
September	5	68.6	22	46.9	5	82.5	18	31.2	66.47	44.80	55.50	4.740	.....	.38	.34	.41	.13	.12	30.258	29.413	29.864	.690	.170	.346	100	31	76
October	6	58.9	30	34.0	11	70.0	18	24.5	56.87	37.73	47.40	6.560	.....	.46	.20	.40	.16	.24	30.308	29.180	29.863	.500	.099	.264	100	31	78
November	2	43.0	30	5.2	3	53.2	30	-4.0	31.64	18.30	25.17	5.050	24.00	.55	.54	.18	.06	.22	30.332	28.432	29.689	.232	.039	.109	100	42	75
December	4	46.5	1	-3.5	4	50.3	2	-26.0	28.45	9.87	20.12	1.735	14.00	.59	.41	.24	.05	.30	30.680	29.108	29.893	.343	.014	.099	100	31	80
	July		Jan'y		July		Jan'y																				
Year	30	75°.5	30	-4°.9	26	92°.0	30	-26°.5	49°.93	31°.28	40°.93	40.780	124.00	.49	.38	.30	.10	.22	30.680	28.423	29.794	.778	.009	.232	100	20	74

SUMMARY—1874.

MONTHS.	THERMOMETER IN THE OPEN AIR.											RAIN AND SNOW.		CLOUDS.	WINDS.				BAROMETER.			FORCE OR PRESSURE OF VAPOR IN INCHES.			RELATIVE HUMIDITY OR FRACTION OF SATURATION.		
	Mean of hottest day.		Mean of coldest day.		Highest temperature.		Lowest temperature.		Mean of maximum temperature.	Mean of minimum temperature.	Mean of three daily observations.	Amount of rain or melted snow in guage—inches.	Depth of snow—inches.	Mean percentage of cloudiness.	PER CENT. OF DIRECTION.				BAROMETER HEIGHT REDUCED TO FREEZING POINT.								
	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.							N. W. and W.	S. W. and S.	S. E. and E.	N. E. and N.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.
		°		°		°		°	°	°	°																
January	8	48.3	26	-15.5	8	54.4	27	-19.0	27.49	10.12	19.28	4.570	25.00	.56	.40	.21	.14	25	30.623	29.381	29.988	.400	.019	.112	100	41	86
February	14	38.7	2	-15.1	14	46.0	2	-26.0	26.00	8.50	17.50	5.500	40.00	.48	.58	.23	.05	.14	30.719	29.254	29.924	.285	.012	.086	100	26	77
March	4	45.1	24	5.4	19	50.0	1	-5.4	35.78	19.41	27.56	3.400	14.00	.48	.57	.31	.04	.08	30.279	28.983	29.645	.319	.027	.112	100	24	67
April	15	47.9	1	13.9	15	60.0	1	1.0	40.50	26.16	33.30	3.760	30.00	.57	.35	.32	.08	.25	30.260	28.984	29.764	.351	.031	.133	100	26	67
May	28	64.9	1	35.8	28	78.3	2	31.0	61.35	41.71	51.88	4.740	.....	.45	.29	.43	.12	.16	30.200	29.110	29.708	.602	.096	.255	100	19	64
June	28	71.6	12	48.1	28	82.8	2	41.2	69.71	51.06	60.17	4.930	.....	.65	.31	.35	.04	.30	30.004	29.323	29.692	.685	.177	.391	100	26	74
July	15	76.3	3	54.1	15	86.3	3	50.0	75.44	58.29	66.73	2.100	.....	.54	.23	.54	.12	.11	30.045	29.432	29.799	.794	.304	.515	100	41	80
August	11	72.4	26	54.7	11	82.0	27	40.3	72.75	53.69	63.17	5.390	.....	.43	.36	.44	.06	.14	30.167	29.373	29.826	.662	.250	.447	100	34	77
September	10	68.4	22	50.2	10	83.3	23	34.2	67.73	48.69	58.38	4.370	.....	.53	.26	.41	.10	.23	30.321	28.981	29.921	.573	.240	.402	100	34	83
October	11	54.2	23	37.3	26	65.7	23	28.0	57.46	37.30	47.91	1.140	.....	.44	.28	.50	.04	.18	30.341	29.355	29.851	.427	.104	.254	100	26	75
November	5	47.5	22	13.8	5	54.7	23	5.2	41.32	24.62	32.66	3.060	10.00	.49	.46	.37	.07	.10	30.406	29.024	29.922	.353	.057	.158	100	39	80
December	3	38.7	15	-4.0	3	44.7	16	-19.1	26.67	7.01	17.63	1.980	13.00	.57	.36	.20	.11	.33	30.606	29.319	29.858	.254	.009	.093	100	45	81
	July		Jan'y		July		Feb'y																				
Year	15	76°.3	26	-15°.5	15	86°.3	2	-26°.0	50°.18	32°.21	41°.35	44.940	132.00	.52	.37	.36	.08	.19	30.719	28.981	29.825	.794	.009	.246	100	19	76

SUMMARY—1875.

MONTHS.	THERMOMETER IN THE OPEN AIR.											RAIN AND SNOW.		CLOUDS.	WINDS.				BAROMETER.			FORCE OR PRESSURE OF VAPOR IN INCHES.			RELATIVE HUMIDITY OR FRACTION OF SATURATION.		
	Mean of hottest day.		Mean of coldest day.		Highest temperature.		Lowest temperature.		Mean of maximum temperature.	Mean of minimum temperature.	Mean of three daily observations.	Amount of rain or melted snow in guage—inches.	Depth of snow—inches.	Mean percentage of cloudiness.	PER CENT. OF DIRECTION.				BAROMETER HEIGHT REDUCED TO FREEZING POINT.								
	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.							N. W. and W.	S. W. and S.	S. E. and E.	N. E. and N.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.
		°		°		°		°	°	°	°																
January	29	25.9	20	-5.9	31	32.6	20	-22.5	17.23	-1.56	8.22	2.00	19.70	.47	.70	.06	.04	20	30.397	29.212	29.938	.144	.015	.056	100	50	79
February	24	39.3	7	-8.3	24	46.0	14	-20.0	23.59	3.82	13.44	3.80	8.50	.45	.60	.19	.10	.11	30.349	29.101	29.778	.267	.014	.082	100	44	79
March	27	36.9	1	4.7	27	45.2	1	-3.5	31.89	15.28	24.54	4.47	33.60	.52	.39	.26	.07	.28	30.550	29.271	29.909	.201	.025	.101	100	34	71
April	25	47.0	20	18.4	24	58.0	21	14.6	44.79	28.50	36.69	3.85	4.50	.51	.52	.22	.09	.17	30.300	29.194	29.745	.276	.068	.141	100	24	64
May	25	70.3	2	39.5	25	85.4	6	32.2	61.22	41.78	52.07	3.31	.....	.45	.33	.41	.11	.15	30.239	29.243	29.772	.661	.122	.257	100	24	67
June	24	73.4	13	51.5	28	85.0	14	39.6	70.88	51.31	61.18	4.85	.....	.52	.25	.47	.17	.11	30.123	29.318	29.812	.717	.214	.407	100	31	74
July	5	74.0	18	60.8	5	85.0	19	50.3	77.00	57.58	66.83	2.11	.....	.45	.35	.52	.04	.09	30.074	29.440	29.748	.729	.254	.490	99	34	75
August	29	74.8	2	59.9	29	87.8	24	45.3	78.28	58.33	68.20	2.32	.....	.43	.25	.57	.16	.02	30.213	29.685	29.893	.844	.246	.557	100	35	81
September	3	68.2	29	40.8	1	81.8	29	26.2	63.75	43.51	54.17	5.10	.....	.51	.40	.42	.09	.09	30.301	29.242	29.789	.648	.118	.323	100	35	78
October	4	55.7	29	31.9	4	62.8	14	21.7	51.52	34.52	43.61	4.75	.....	.58	.38	.23	.11	.28	30.274	29.039	29.802	.421	.097	.229	100	29	78
November	13	39.3	30	-9.8	13	51.7	30	-16.2	35.02	19.08	27.17	3.87	14.50	.53	.73	.10	.06	.11	30.526	28.939	29.814	.275	.014	.129	100	39	81
December	23	41.6	20	-8.0	23	50.2	20	-23.0	26.67	9.17	18.78	1.51	13.00	.51	.62	.20	.02	.16	30.539	28.963	29.768	.217	.015	.091	100	32	80
	Aug.		Nov.		Aug.		Dec.																				
Year	29	74°.8	30	-9°.8	29	87°.8	20	-23°.0	48°.49	30°.11	39°.58	41.94	93.80	.50	.46	.30	.09	.15	30.550	28.939	29.814	.844	.014	.239	100	24	76

SUMMARY—1876.

MONTHS.	THERMOMETER IN THE OPEN AIR.											RAIN AND SNOW.		CLOUDS.	WINDS.				BAROMETER.			FORCE OR PRESSURE OF VAPOR IN INCHES.			RELATIVE HUMIDITY OR FRACTION OF SATURATION.		
	Mean of hottest day.		Mean of coldest day.		Highest temperature.		Lowest temperature.		Mean of maximum temperature.	Mean of minimum temperature.	Mean of three daily observations.	Amount of rain or melted snow in guage—inches.	Depth of snow—inches.	Mean percentage of cloudiness.	PER CENT. OF DIRECTION.				BAROMETER HEIGHT REDUCED TO FREEZING POINT.								
	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.							N. W. and W.	S. W. and S.	S. E. and E.	N. E. and N.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.
		°		°		°		°	°	°	°																
January	1	44.6	30	0.2	19	49.1	25	−14.4	27.15	9.98	18.72	3.92	23.00	.40	.61	.16	.10	.13	30.439	29.109	29.831	.307	.023	.099	100	38	81
February	7	38.1	24	−13.4	15	45.6	24	−19.7	27.80	8.99	19.02	8.39	25.50	.41	.60	.22	.05	.13	30.783	28.458	29.838	.242	.016	.086	100	28	74
March	7	47.1	19	10.7	7	55.2	19	0.0	35.33	19.35	27.86	8.20	18.00	.58	.42	.18	.15	.25	30.265	29.005	29.792	.278	.035	.123	100	23	74
April	14	46.6	5	31.2	13	57.0	2	23.1	46.31	29.78	39.36	1.65	9.00	.58	.38	.17	.10	.35	30.209	29.278	29.762	.288	.054	.160	100	22	67
May	28	69.2	1	37.7	27	84.0	1	29.6	59.72	39.90	50.70	3.73	.....	.55	.36	.34	.14	.16	30.319	29.196	29.826	.517	.089	.256	100	21	69
June	28	74.9	5	51.8	28	86.6	1	35.3	75.32	54.90	65.27	2.56	.....	.61	.23	.64	.07	.06	30.156	29.353	29.830	.816	.227	.494	100	35	80
July	18	79.0	26	54.6	18	90.0	27	47.6	78.19	59.80	68.45	5.80	.....	.45	.35	.52	.12	.01	30.045	29.350	29.776	.833	.306	.545	100	38	78
August	7	85.3	21	55.8	6	96.7	24	39.8	78.38	55.62	67.60	0.91	.....	.32	.60	.33	.05	02	30.170	29.583	29.872	.935	.209	.501	98	32	73
September	1	63.8	28	48.5	1	72.4	17	34.5	64.44	42.86	55.05	4.28	.....	.47	.33	.36	.09	.22	30.353	29.288	29.827	.598	.177	.342	100	35	79
October	24	55.8	15	31.2	4	63.3	31	24.9	51.74	33.54	43.06	3.91	4.00	.48	.51	.34	.04	.11	30.090	29.265	29.759	.472	.094	.215	100	31	74
November	3	50.0	30	16.1	1	56.0	30	12.0	41.81	30.05	35.77	4.35	.50	.58	.33	.05	.06	.56	30.317	29.320	29.808	.375	.063	.174	100	35	79
December	14	28.9	17	−11.6	4	40.4	26	−21.5	22.64	3.05	13.45	4.67	43.00	.48	.42	.31	.01	.26	30.398	28.689	29.769	.146	.014	.073	100	41	82
	Aug.		Feb'y		Aug.		Dec.																				
Year	7	85°.3	24	−13°.4	6	96°.7	26	−21°.5	50°.74	32°.32	42°.03	52.37	123.00	.49	.43	.30	.08	.19	30.783	28.458	29.808	.935	.014	.256	100	21	76

SUMMARY—1877.

MONTHS.	THERMOMETER IN THE OPEN AIR.											RAIN AND SNOW.		CLOUDS.	WINDS.				BAROMETER.			FORCE OR PRESSURE OF VAPOR IN INCHES.			RELATIVE HUMIDITY OR FRACTION OF SATURATION.		
	Mean of hottest day.		Mean of coldest day.		Highest temperature.		Lowest temperature.		Mean of maximum temperature.	Mean of minimum temperature.	Mean of three daily observations.	Amount of rain or melted snow in guage—inches.	Depth of snow—inches.	Mean percentage of cloudiness.	PER CENT. OF DIRECTION.				BAROMETER HEIGHT REDUCED TO FREEZING POINT.								
	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.							N. W. and W.	S. W. and S.	S. E. and E.	N. E. and N.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.
		°		°		°		°	°	°	°																
January	20	35.6	25	−11.3	20	40.2	26	32.5	20.16	−3.57	8.37	3.29	28.50	.47	.45	.33	02	.20	30.406	28.888	29.847	.204	.009	.064	100	53	82
February	3	34.2	9	12.1	23	40.1	9	−4.0	33.26	16.02	25.10	1.20	10.50	.55	.47	.25	.03	.25	30.148	29.242	29.776	.206	.038	.107	100	28	73
March	27	48.3	18	8.0	27	52.5	20	1.0	35.48	19.28	27.80	5.67	11.00	.57	.33	.30	.17	.20	30.377	28.970	29.821	.384	.044	.130	100	23	75
April	27	55.8	12	33.3	23	74.1	4	21.1	51.67	32.12	42.66	3.18	.50	.52	.31	.15	.11	.43	30.345	29.144	29.842	.315	.084	.176	100	19	65
May	31	71.6	3	39.8	31	84.2	10	33.6	62.84	41.84	52.77	1.94	.....	.49	.28	.24	.03	.45	30.120	29.298	29.753	.498	.130	.275	100	21	66
June	1	73.0	22	57.7	1	89.0	23	43.5	73.13	54.40	63.59	1.98	.....	.51	.40	.47	.07	.06	30.094	29.329	29.791	.659	.240	.446	100	38	75
July	18	74.1	26	56.8	18	87.4	27	50.7	76.23	58.77	67.78	1.64	.....	.58	.25	.41	.20	.14	30.040	29.438	29.771	.747	.299	.524	100	30	78
August	24	75.1	26	61.9	24	87.2	31	50.0	75.81	57.55	67.13	5.28	.....	.58	.24	.34	.32	.10	30.138	29.564	29.801	.739	.329	.539	100	41	81
September	13	72.2	30	50.7	17	84.3	30	29.0	70.68	46.16	59.70	1.11	.....	.35	.31	.38	.11	.20	30.226	29.421	29.877	.762	.190	.411	100	34	78
October	1	61.3	26	26.8	1	72.4	27	14.8	51.46	34.71	43.01	4.78	7.00	.56	.27	.23	.13	.37	30.403	29.449	29.888	.484	.091	.245	100	39	82
November	9	54.0	22	24.2	9	61.0	22	11.6	44.13	30.01	37.21	7.95	3.00	.59	.36	.29	.16	.19	30.479	29.130	29.944	.436	.032	.195	100	36	80
December	5	43.5	2	14.2	6	52.0	14	3.5	34.56	16.25	25.61	2.15	6.00	.43	.47	.18	.03	.32	30.494	29.187	29.937	.374	.045	.114	100	44	76
	Aug.		Jan'y		June		Jan'y																				
Year	24	75°.1	25	−11°.3	1	89°.0	26	−32°.5	52°.45	33°.63	43°.39	40.17	66.50	.52	.34	.30	.12	.24	30.494	28.888	29.837	.762	.009	.269	100	19	76

SUMMARY FROM 1869 TO 1877, INCLUSIVE.

MONTHS.	THERMOMETER IN THE OPEN AIR.											RAIN AND SNOW.		CLOUDS.	WINDS.				BAROMETER.			FORCE OR PRESSURE OF VAPOR IN INCHES.			RELATIVE HUMIDITY OR FRACTION OF SATURATION.		
	Mean of hottest day.		Mean of coldest day.		Highest temperature.		Lowest temperature.		Mean of maximum temperature.	Mean of minimum temperature.	Mean of three daily observations.	Amount of rain or melted snow in guage—inches.	Depth of snow—inches.	Mean percentage of cloudiness.	PER CENT. OF DIRECTION.				BAROMETER HEIGHT REDUCED TO FREEZING POINT.								
	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.	Day.	Temperature.							N. W. and W.	S. W. and S.	S. E. and E.	N. E. and N.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.
		°		°		°		°	°	°	°																
1869	July 11	74.2	Jan. 22	-3.8	July 11	87.2	Mar. 6	-22.0	50.01	33.37	41.77	44.72	84.92	.55	.41	.29	.14	.16	30.519	28.858	29.780	.826	.005	.250	100	25	76
1870	July 24	82.8	Jan. 14	-9.7	July 24	94.0	Feb. 4	-17.0	53.02	35.45	44.26	40.98	78.75	.50	.35	.33	.10	.22	30.578	28.902	29.791	.878	.016	.279	100	13	74
1871	May 30	76.0	Jan. 23	-14.9	May 30	88.6	Jan. 23	-20.6	50.44	33.33	41.92	41.63	80.50	.50	.42	.33	.10	.15	30.585	29.000	29.795	.956	.006	.244	100	17	75
1872	July 16	79.5	Dec. 25	-11.8	June 30	90.6	Dec. 25	-23.0	50.02	33.22	41.60	48.58	113.00	.53	.37	.28	.13	.22	30.446	28.712	29.766	.793	.011	.258	100	23	77
1873	July 30	75.5	Jan. 30	-4.9	July 26	92.0	Jan. 30	-26.5	49.93	31.28	40.93	40.78	124.00	.49	.38	.30	.10	.22	30.680	28.423	29.794	.778	.009	.232	100	20	74
1874	July 15	76.3	Jan. 26	-15.5	July 15	86.3	Feb. 2	-26.0	50.18	32.21	41.35	44.94	132.00	.52	.37	.36	.08	.19	30.719	28.981	29.825	.794	.009	.246	100	19	76
1875	Aug. 29	74.8	Nov. 30	-9.8	Aug. 29	87.8	Dec. 20	-23.0	48.49	30.11	39.58	41.94	93.80	.50	.46	.30	.09	.15	30.550	28.939	29.814	.844	.014	.239	100	24	76
1876	Aug. 7	85.3	Feb. 24	-13.4	Aug. 6	96.7	Dec. 26	-21.5	50.74	32.32	42.03	52.37	123.00	.49	.43	.30	.08	.19	30.783	28.458	29.808	.935	.014	.256	100	21	76
1877	Aug. 24	75.1	Jan. 25	-11.3	June 1	89.0	Jan. 26	-32.5	52.45	33.63	43.39	40.17	66.50	.52	.34	.30	.12	.24	30.494	28.888	29.837	.762	.009	.269	100	19	76
	1876		1874		1876		1877					Mean.	Mean.														
Nine years	Aug. 7	85°.3	Jan. 26	-15°.5	Aug. 6	96°.7	Jan. 26	-32°.5	50°.59	32°.77	41°.85	44.01	99.61	.51	.39	.31	.10	20	30.783	28.423	29.801	.956	.005	.253	100	13	76

SUMMARY OF

METEOROLOGICAL OBSERVATIONS

TAKEN AT THE

Maine State College of Agriculture and the Mechanic Arts,

FROM JANUARY, 1869, TO JANUARY, 1878.

BY PROF. M. C. FERNALD.

Latitude 44° 53′ 10″ N. Longitude 68° 38′ 57″ W. Elevation above the sea, 134 feet.

EXPLANATIONS, DEDUCTIONS AND REMARKS.

The hours of observation are the same as those formerly adopted by the Smithsonian Institution, viz: 7 A. M., 2 P. M., and 9 P. M.

The figures in the columns headed "Force or pressure of vapor," show the height at which a column of mercury is maintained by the weight of the moisture of the air.

The warmest day of the year 1877 was August 24th, when the mean temperature was 75°.1, and the coldest day was January 25th, when the mean temperature was 11°.3 below zero.

The highest temperature (89°.0) recorded during the year was on the 1st of June, and the lowest temperature (32°.5 below zero) on the 26th of January.

The range of temperature between the two extremes is 121°.5, or 7°.7 greater than the average range between the extremes for the last nine years.

The warmest day within the period covered by the tables was August 7th, 1876, when the mean temperature was 85°.3, and the coldest day January 26th, 1874, when the mean temperature was 15°.5 below zero. The highest temperature (96°.7) occurred on August 6th, 1876, and the lowest temperature (32°.5 below zero) on January 26th, 1877.

A comparison, as regards temperature, of the several months of 1877, with the mean temperature of corresponding months for nine years, is given below.

Months.	Mean temperature from 1869 to 1877, inclusive.	Mean temperature for 1877.	
January	15°.68	8°.37	7°.31 colder.
February	18°.79	25°.10	6°.31 warmer.
March	26°.64	27°.80	1°.16 "
April	39°.52	42°.66	3°.14 "
May	51°.71	52°.77	1°.06 "
June	62°.51	63°.59	1°.08 "
July	67°.73	67°.78	.05 "
August	65°.80	67°.13	1°.33 "
September	57°.06	59°.70	2°.64 "
October	45°.61	43°.01	2°.60 colder.
November	32°.19	37°.21	5°.02 warmer.
December	19°.21	25°.61	6°.40 "

The year 1877 (mean temperature 43°.39) averaged 1°.54 warmer than the mean temperature of the nine years above noticed.

The earliest autumnal frost was on the morning of September 7th, doing little or no injury to vegetation. The first destructive frost was on the morning of the 30th of September.

The earliest thunder shower of the season was on the evening of the 18th of May.

The rain-fall of 1877 (40.17 inches) was less by 3.84 inches than the average annual rain-fall for nine years; and the amount (66.50 inches) of snow less by 33.11 inches than the average annual snow-fall for the same period.

During January, February, March, November and December, 1877, the prevailing wind was from the northwest and west; during April, May and October, from the northeast and north, and during June, July, August and September, from the southwest and south. The wind attained a high degree of force on January 14th, February 13th, March 18th, April 12th, May 10th, November 8th and 19th, December 17th and 31st, and rose to a strong gale on the 9th of March.

The prevailing wind for the nine years from 1869 to 1877, inclusive, was from the northwest, although during the warm months the wind prevailed from the southwest and south. The relative direction and force of wind for this period are indicated approximately by the following numbers: N. W. and W., 4; S. W. and S., 3; S. E. and E., 1; N. E. and N., 2.

The most brilliant auroras of 1877 were on the evenings of January 6th and April 14th.

The luna halos of January 28th and March 22d were of marked character. A brilliant solar halo occurred on April 28th. During the latter part of March the zodiacal light was especially bright for several nights in succession.

The barometer indicated the greatest atmospheric pressure in the month of December, and the least in the month of January. The range between the two extremes was 1.606 inches. The least mean pressure was during the month of May, and the greatest during the month of November.

The mean pressure of the vapor in the atmosphere was sufficient to sustain a column of mercury a little more than one-fourth of an inch in height.